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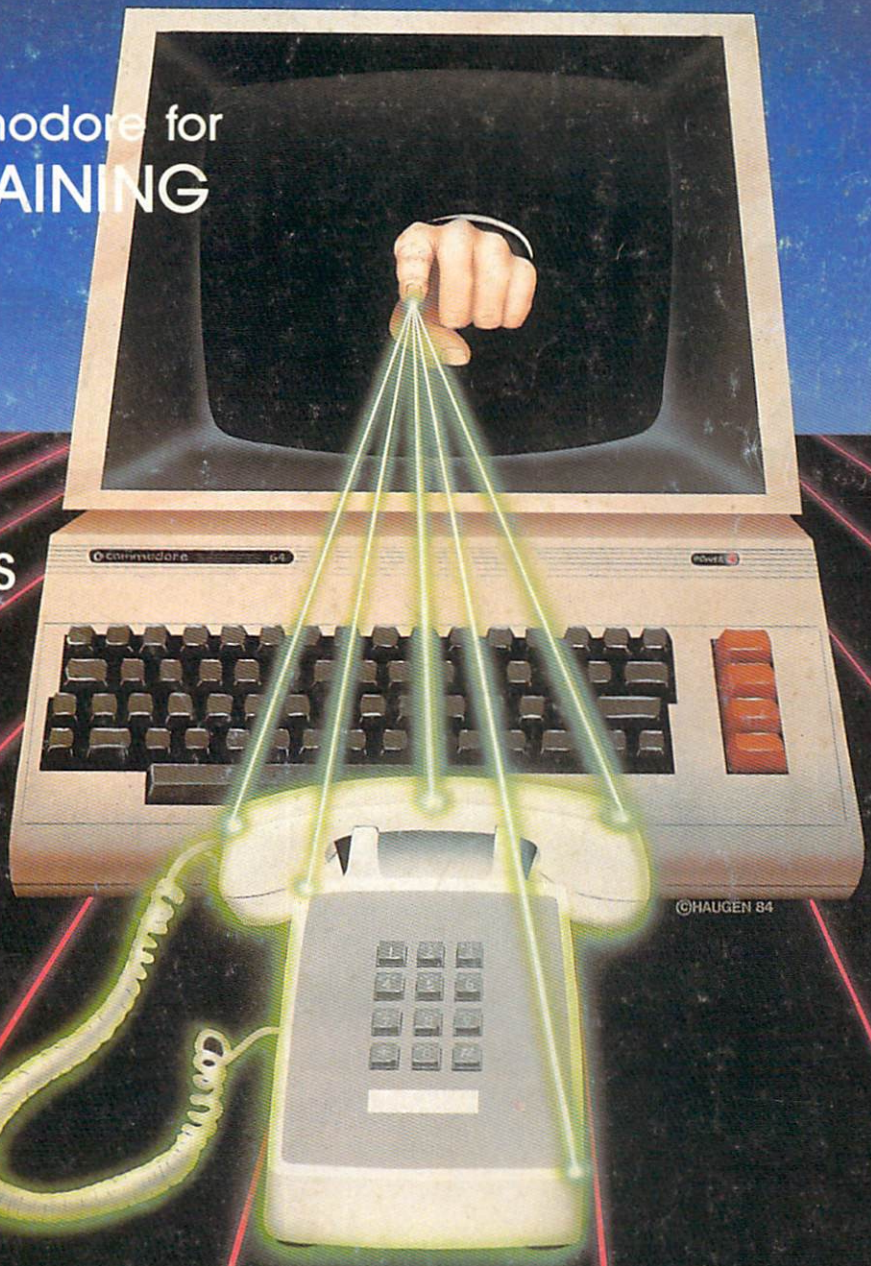

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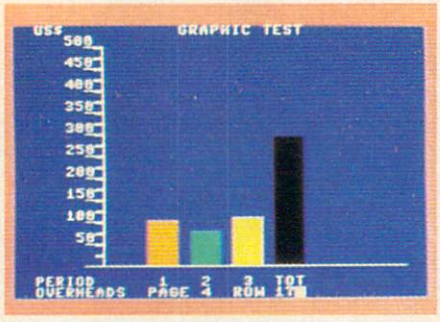

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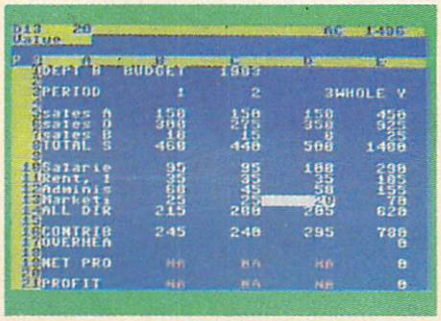

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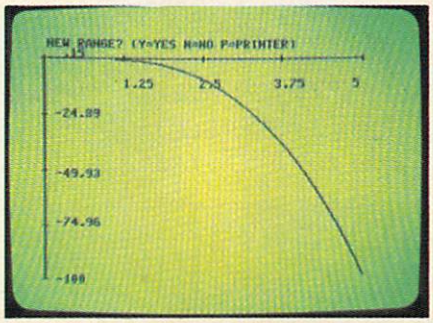

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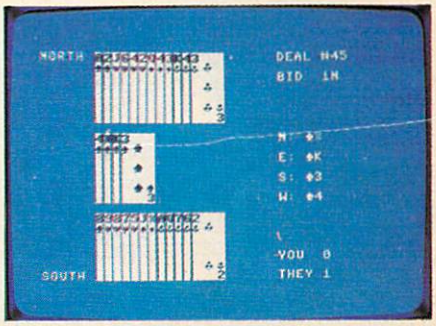

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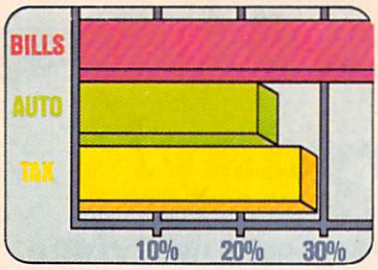

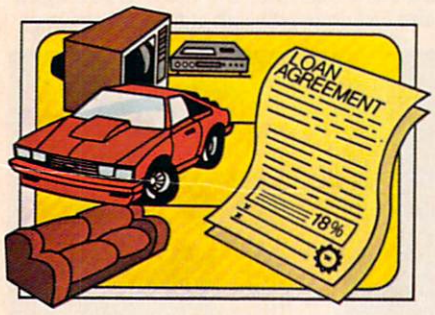

EDUCATION SECTOR

19 **B*A*S*I*C Training: Beginner's Introduction to Commodore BASIC Programming** / JONATHAN SECAUR — GENERAL
What does a dollar sign mean to your computer? The answer may be worth more than money.

21 **BASIC Education: Programming for Learning, Part IV–Getting Into Inputs** / ANDY VAN DUYNE — C-64 & VIC-20 (Application Program)
Interactive educational programs require well-defined input techniques to accept student responses. Example routines are presented, along with an illustrative program musical ear-training.

46 **Electronic Blackboard** / MARYANNE DODD — C-64/GENERAL (Educational Software Reviews)
In honor of springtime, a variety bouquet of software is reviewed–including a computerized introduction to the C-64, a vocabulary building game, and a multi-level math series.

64 **Data Organization for the VIC-20: Part IV** / ARTHUR J. DUDLEY — VIC-20
An examination of arrays completes our series on how BASIC stores data variables.

REVIEWS AND RECREATION SECTOR

51 **BINGO Caller** / JIM BERNARD — C-64 (Game Program)
A modern way to play one of the most popular games of chance.

54 **Along the Adventure Game Trail** / FRED DART — GENERAL (Reviews)
What makes a good adventure game? Some crucial features and a few of the best game programs are described.

56 **The KoalaPad Touch Tablet: How To Bear With It–Part I: Overview** / IAN ADAM — C-64 & VIC-20 (Review)
The perfect input device for artistically-inclined non-typists is reviewed.

59 **KoalaPad–Part II: Using "Koala Painter" Picture Files** / GEORGE R. GAUKEL — C-64 (Utility Program)
For advanced programmers–how to make further use of the KoalaPad pictures after they are stored on disk.

88 **Rescue** / MIKE SCHARLAND — VIC-20 with Joystick (Game Program)
Our Junior Programmer's contributions this month is a rather sophisticated VIC-20 game with custom characters and a non-violent theme.

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COMMANDER, USPS 703-690, ISSN 0746-3197, is published monthly by Micro Systems Specialties, 3418 S. 90th St., Tacoma, WA 98409. Domestic subscriptions: 12 issues, $22.00. Second class postage paid at Tacoma, WA 98413 and additional mailing offices. POSTMASTER: Send address changes to *COMMANDER*, P.O. Box 98827, Tacoma, WA 98498. Entire contents copyright ©1984 by Micro Systems Specialties. All rights reserved. Commodore 64, VIC-20, B-128, and PET are trademarks of Commodore Business Machines, Inc. Issue No. 16.

Menu

FEATURES SECTOR

VIC-20 & C-64 **Colin's Column /** COLIN F. THOMPSON 5

A guided tour through the VIC-20's memory blocks provides all you ever wanted to know about the structure of RAM and ROM, but were afraid to remember; plus tidbits for C-64 users.

C-64 & VIC-20 (Utility Program) **Command Post /** JIM GRUBBS 10

Complementing last month's column, add transmitting capability to your ham-computer setup; also a look at log-in software.

C-64 & VIC-20 (Utility Program) **Explorations With Assembly Language /** ERIC GIGUERE 31

Start our newly-constituted assembly language series with an easy-to-use disassembler/monitor written in BASIC.

GENERAL **Introducing COMMODORE'S B-SERIES /** HOWARD ROTENBERG 70

A restyled keyboad and powerful Extended BASIC are among the exciting features of Commodore's new family of business computers.

HARD SECTOR DEPARTMENTS

News Releases 81

"Reviewed in *COMMANDER*" 84

Letters to *COMMANDER* 92

REM's to Readers (from *COMMANDER'S* staff) 94

Advertiser's Index 96

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COMMANDER is published monthly by:
MICRO SYSTEMS SPECIALTIES, P.O. Box 98827, Tacoma, Washington 98498

COMMANDER MAGAZINE
Regional Advertising Offices

Home Office, P.O Box 98827,
Tacoma, Wa. 98498. (206) 584-6759

Garland Associates, P.O. Box 314 S.H.S.
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Subscription Rates (U.S. Funds)	*Per Year*
U.S.	$22.00
Canadian, Mexican	$26.00
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Circle No. 28

Colin's Column

Reviews, Previews, News and Views

By Colin F. Thompson

Peace and quiet. Isn't it wonderful? The kids are asleep, your routine daily tasks are done and you sit in front of the computer with your mind at ease. Tonight, you say to yourself, I'm going to have some fun. It's just me and the VIC. Perhaps your new modem will take you to some interesting places and allow you to meet some new friends. Maybe the Christmas card list needs some changes, or a few letters could be written on the word processor. You might want to continue that BASIC program you've been writing. What you really do is not terribly important, it's the fun and excitement that counts.

So you sit down at your computer with high expectations, and what usually happens? Before you know it, chances are, the complexity of your task increases many times over, and you're awash in ambiguous technical decisions and unknown terminology. Your only hope is either to stick with the simplest of programs and projects, or to learn more about the inner workings and capabilities of your computer. My choice, naturally, is to pursue the second course, and acquire information through magazines, user's groups, and other sources. To that end, I'd like to take you on a guided tour of the VIC-20's inner memory.

A 64K VIC?

Sure. Every VIC-20 is a 64K microcomputer. The only catch is cost. When you first bought your VIC, it was missing some memory. Commodore left out most of the RAM memory chips so the VIC could be sold at rock bottom prices. If you want your VIC to do something besides play games, some extra memory must be purchased and then plugged into the "expansion port." That's the wide slot in the back of the VIC where game cartridges normally plug in. Extra memory cartridges come in four different sizes: 3K, 8K, 16K and 24K. The last three sizes are in increments of eight. That's important, so let's "expand" on the idea.

RAM AND ROM DEMYSTIFIED

Eight is a magic number in the VIC's language. It's so important to your understanding of how the VIC works that I am going to ask you to get a pencil and paper. If your understanding of computers could be improved on, please follow along, It is a very simple VIC (not 64) exercise, but to get a full measure of understanding, please draw the diagram as I outline it. First draw eight large squares from top to bottom. Draw them well, neatness counts. Under each box, starting with the one on the bottom, number the boxes zero, one, two and on through seven. (For some reason, counting on computers usually starts at Ø instead of 1.) What you are looking at is the basis of the VIC's memory. Hence the term "memory map." Now let's add some details.

Over blocks Ø, 1, 2, and 3 mark "RAM." Blocks 6 and 7 should be marked "ROM." Draw a horizontal line through the center of block 4 and label the bottom half "ROM" and the top half "RAM." That leaves Block 5 unlabeled. It is special, and should be marked "RAM or ROM." Carefully outline the borders of blocks Ø, 4, 6 and 7 so the boxes stand out. These blocks are included with the "bare VIC" you first bought.

The RAM-ROM concept must be mastered before we get any farther with our mapping. Each of the eight blocks represent 8K of memory. Eight blocks times 8K equals 64K of memory. The two kinds of memory used in the VIC are Random Access Memory (RAM) and Read Only Memory (ROM). All computers use a mix of the two types. The VIC is provided with ROM in blocks 4, 6 and 7. ROM is permanent memory. So what's in ROM? A series of machine language programs, written by Commodore, and placed permanently into the ROM chips. The programs allow the computer to function as a computer, rather than say a digital watch or a microwave oven. You could say that the contents of ROM give the VIC its personality.

RAM is a slightly different story. Programs or information stored in RAM may be changed. The purpose of RAM is to provide a storage place for the programs you buy or write. These programs let the VIC do some useful work. ROM retains its programs when the power to the VIC is turned off, but RAM forgets everything.

A STROLL DOWN MEMORY LANE

Starting from the top, we will examine each of the VIC's eight blocks. At the end of the examination, you should remember at least one thing: The VIC has a potential of 64K of memory, arranged in eight blocks of 8K.

Block 7 is top dog in the VIC. It is known as the Kernal ROM. The Kernal actually performs the instructions and operations that are started in other parts of the VIC. All Commodore computers have a Kernal ROM, and the different Kernals are so similar that many programs written for the PET and C-64 will run on the VIC.

Block 6 is the BASIC Interpreter. BASIC is a "high level" language. The grammar (syntax) of BASIC is much closer to English than the VIC's native language, Binary. The BASIC instructions that programs send to the VIC must be interpreted (changed) before they may be executed. This language translation is done in the BASIC interpreter. Each BASIC instruction in the program is examined by Block 6, and then reduced to a series of binary instruction codes. These codes are sent to the Kernal ROM for execution. Block 6 and 7 work closely together, thus forming the heart of the VIC.

Block 5 we have labeled RAM or ROM. This is the block that games and other cartridges plug into. When you plug in a cartridge, the programs stored in the cartridge's ROM enter the VIC through Block 5. When you turn on the VIC, it looks at Block 5 to see if a cartridge is plugged in. If so, the VIC executes the Block 5 program instead of displaying the power-up message. In computer terms, *execute* means to RUN the program, or carry out an instruction, not the gas chamber.

Most of the cartridges that plug into the VIC work from Block 5–but not all. Some of them enter in Block 5 but work from Block 3 also. More on Block 3 later.

Why have we labeled Block 5 RAM of ROM? If necessary, you may place 8K or RAM into Block 5. "Why would I want to do that?" you ask. The answer lies in Blocks 1, 2 and 3, so let's skip Block 4 for the moment and look in on RAMland (not L.A.).

In my two-year-long travel through the VIC-20, I have yet to encounter what I consider a good, useful, businesslike program that will run in the unexpanded VIC. All word processors, spreadsheets, databases and similar programs require at least 8K or expansion RAM to function. Since the VIC has only a paltry 3.5K of RAM when you buy it, the extra memory must be purchased and installed. Remember that expansion RAM memory comes in 8K chunks: 8K, 16K or 24K.

You need extra memory for two reasons. The programs are usually long. A typical business program needs 10K just for the program. Most programs need additional memory to store the data (names, addresses, etc.).

To illustrate this, let's use TOTL.TEXT (TT), the popular wordprocessor. The first consideration when evaluating a new program is "how much memory does it need." That's an easy question. Just read the requirements on the outside of the box. TT clearly states it needs 16K of additional RAM. If you don't already have a 16K RAM cartridge, you must buy one to use TT. 16K cards cost between $50 and $70. Let's assume you buy the 16K card and plug it into the VIC. When you turn the VIC on, the screen will now show that there are 19967 BYTES FREE. The 16K that you plugged in plus the 3.5K the VIC already had results in the number 19967.

Now you can load and run TOTL.TEXT. That takes care of the memory requirements of the program, or does it? Remember the second reason we need extra memory? Data. In this case, data is the letters and the other documents we type into the wordprocessor. With the 19.9K (call it 20K) VIC,TT will let you type in a good long letter, but there are limits to how long the letter can be. For the sake of explanation, let's say you can type in a 5-page letter with a 20K VIC. If you wanted to type a longer letter, you will need more memory. If you bought a 24K RAM card, instead of the 16K card, you could type in a ten-page letter. The extra 8K is used to store more data.

Blocks 1, 2 and 3 are where the "add-on" memory is stored. The 16K card we discussed is made up of two 8K blocks of RAM memory. When the card is plugged in, the chunks of RAM take up residence in Blocks 1 and 2. If you add another 8K chunk, it goes into Block 3. In most cases, the VIC is limited to 28159 bytes of available memory. That includes 24K in Blocks 1, 2, and 3 and the 3.5K built in.

The obvious question now is "If I plugged in an extra 8K into Block 5, will I have a 36K VIC?" Sadly, no. The VIC is arranged so that all the RAM memory used for BASIC programs must be contiguous – in a row, connected. Block 4 gets in the way, so in most cases you are limited to 29K. Before we get too confused, let's return to the map. Draw a large brace enclosing Blocks 1, 2 and 3. Label the point of the brace "BASIC program area for the expanded VIC."

Back to Block 5–or "why put RAM in a block that BASIC can't use?" Thousands of programmers have spent countless hours figuring out something useful to do with Block 5. They have been quite successful. There is a scheme which lets you load a BASIC program of less than 8K in length into Block 5, and then use Blocks 1, 2 & 3 as storage for data. This nets you an extra 8K of data the program may use (a much longer letter, for example). The scheme requires an 8K RAM card to be plugged into Block 5. Several RAM cards have the ability to locate themselves into Block 5, as well as the normal 1, 2 & 3. Another use for RAM in Block 5 would be to store a machine language program. That works well. Did you ever wonder how Data 20 gets 80 columns on the VIC's screen? They put both ROM and RAM into Block 5 to do the trick.

The uses for RAM in Block 5 are endless, but one more example might give you something to say to your C-64 friends. If you were so inclined, you could buy a plug-in card that expands the VIC's memory to as much as 280K of RAM! The scheme is called "Paged Memory." I have one such device that allows me to use four different 16K "pages" of RAM. Each page may be "flipped" so that it is seen by the VIC in Block 5. Four pages of 16K equals an extra 64K of memory I can use to hold BASIC programs. It's getting confusing, but the ability of the VIC to see memory in a variety of places is one reason why I like the VIC. The C-64 offers a completely different kind of challenge. It's 88K of memory is arranged so that RAM or ROM may be selected at will. The C-64 is not a 'big VIC.' The two computers are only distant relatives, connected by marriage to the BASIC interpreter, the Kernal ROM, and certain input/output ports.

Block 4 is an active, multipurpose block. The bottom half holds 4K of ROM. This ROM makes the characters you see on the screen, hence the name Character Generator. The upper half is RAM, but is not used to hold programs. It keeps track of the colors of the characters and all of the Input/Output (I/0) functions. The I/O functions include sending and receiving data to and from the peripheral equipment attached to the VIC. The VIC commonly uses a disk drive, tape recorder, printer, joysticks and TV screen as peripherals. All information exchanged between the VIC and these devices passes through the I/O RAM section of Block 4.

Block Ø completes our tour through the innards of the VIC. I originally identified this block as one that is included in the bare VIC. Most of it is included, but a 3K chunk is missing. The VIC *can* be expanded in less than 8K chunks. A 3K RAM card is available which will expand the VIC's memory to about 7K total. The 3K card is not very useful, but if you only need a little more RAM, the option is open to you. There is a useful plug-in card that uses the 3K slot. It's called the Superexpander (SE). Commodore released the card just after the VIC was born. The SE adds either of two abilities to the VIC: More BASIC commands or 3K or RAM. You can use one or the other, but not both together. The extra commands let you write graphics and music programs without resorting to POKES, PEEKS or high level math. It's really fun to use, and can be mastered easily.

The rest of Block Ø includes the 3.5K of built-in RAM, screen memory, some "scratchpad" memory the microprocessor uses, and the cassette buffer.

A QUICK TOUR?

Yes, that was the quick tour of the VIC. It's an astounding machine. Remember, the purpose of the tour was to add to your understanding of how the VIC uses commercial programs. Now, when you run into a snag, you should have an idea of where to look to find the problem. For a more detailed explanation of the VIC, pick up a copy of the VIC-20 Programmers Reference Guide. It's about $15 and worth every cent.

RAMAX TO THE RESCUE

I recently added a third VIC system to the technological paradise I call home. (It must be seen to be believed.) Since the new system is used exclusively for word processing, I had to add 16K of RAM and an "expansion" card. The expansion card is a simple printed circuit card that plugs into the Game Slot. This brings the Expansion bus outside the VIC so I can plug in more than one cartridge at once. For my W/P system I need three slots: one for Quick Brown Fox, one for the Data 20 card and one for a RAM card. My other two VICs use Cardco's CardSlot3/s as an expansion card. It works well and has some useful features not found on most cards. This time, however, I wanted to try a different arrangement.

The marketplace is flooded with various brands of RAM cards and Expansion cards. Some are simple and others are quite complex and powerful. After examining the features of many of these devices, I settled on one that fulfilled all my requirements in one neat package. The product is called RAMAX and is made by Apropos Technology. Ramax combines the function of a RAM card and an Expansion card into a single plug-in unit measuring 7½ by 5½ inches. Two expansion ports, facing up, are present at the rear of the unit. Any two cartridges may be plugged in at once. In my case, it's QBF and the Data 20 card. Ramax has four chunks of RAM memory onboard: Three blocks of 8K and a 3K block. A bank of DIP switches allows you to add or subtract memory as you like. For example, you could configure the VIC to have an extra 16K of RAM by turning on the switches marked BLK1 and BLK2. Turn BLK3 and you get 28159 bytes (29K). The Switch marked "RAM" puts 3K of RAM into Block 0. Remember that the 3K and 8K blocks are not to be used together. It doesn't work like that. By switching on BLK5, Ramax lets any one cartridge that operates from Block 5 be used. Note that only one such cartridge may be used at a time.

Why am I using two cartridges at once? After reading our earlier discussion on Blocks, perhaps you've figured out that

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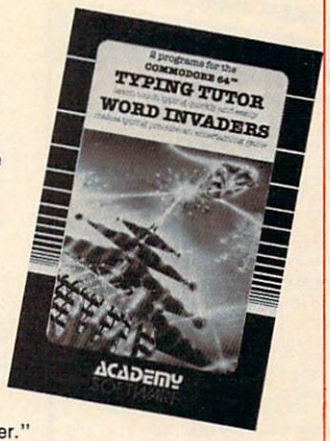

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one of the two cartridges doesn't operate out of Block 5. Right. QBF, even though it is a ROM cartridge, operates from Block 3, so there is no conflict with the Data 20 card which uses Block 5.

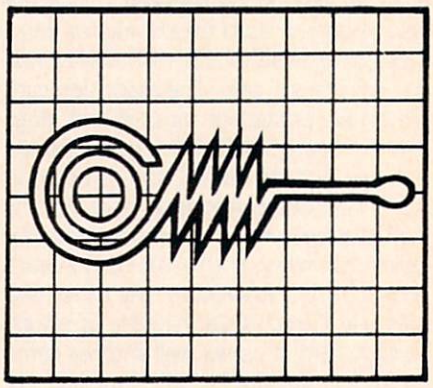
The BLK5 switch on Ramax doesn't put 8K of RAM into Block 5; it just lets any cartridge that uses Block 5 be seen by the VIC. The last of the six switches on Ramax is a reset switch. If you switch it on, then off, the VIC will be reset to the same condition as then power is first turned on. Ramax is protected by a fuse in case a cartridge malfunctions. If this happens, the fuse blows, not the VIC.

In the October issue of *COMMANDER*, I outlined a way to get 31K FREE with the VIC. The scheme called for a 24K card, a 3K card and a Data 20 card. If you plug in these three devices at once and enter POKE 642,4:SYS58232, the result is 31743 BYTES FREE. The trick works well with Ramax, since it provides all the memory needed, plus the slot for the Data 20 card.

I've used the $99 Ramax for 4 months and have encounted no compatibility problems with the horde of cartridges I've tried in it. The user manual is one of the better documents of it's kind. It includes a short BASIC program you may enter that tests the memory. It is covered by a six month limited warranty.

REMEMBER THE C-64?

Apropos also has some goodies for the 64. If your collection of 64 cartridges numbers more than one, you should be looking for an expansion card. Apropos' expansion card will hold up to four cartridges at once. Each of the four slots is activated by a switch. This will save wear and tear on the edge connector of your 64. It also lets you use more than one cartridge at once, and the $49.95 price tag puts it into the "affordable" range. Educational software for the VIC and C-64 is also marketed by Apropos Technology, 350, N. Lantana #801, Camarillo, CA, 93010. (805) 482-3604.



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Circle No. 238

COMMAND POST

By Jim Grubbs

Before long the warmth of spring will return to the air. The trees will begin to fill out with the promise of the hot summer days to come. While there is still just a bit of chill in the air, and before outdoor projects start to dominate the time spent on our hobby, let's finish up the radio teletype project that we started last month.

BIG MOUTH

With last month's program we gained the ability to copy amateur radio and commercial radio teleprinter transmissions (RTTY) using either the VIC-20 or the C-64. Being a good listener is important, but being able to speak can be fun too!

This month, COMMAND POST RTTY TX gives us the other half of the teletype system. Last time we found a Henry Kissinger type who spoke fluent Baudot code and could translate it into ASCII so our computer could print it on the screen. Now we make one more request of our translator. We wish to respond to the messages we are receiving, but we only speak ASCII and our listeners understand only Baudot.

It is as simple as reversing all of the translations we did last time. In the program our transmit translation table is located in lines 440 and 441. L1$ converts the letters, and F1$ converts the numbers and punctuation. All of those "Ds" in F1$ represent space characters and fill in the table for illegal code combinations.

As we did in the receive program, we open the RS-232 channel in line 420 and set the speed to 60 words per minute (approximately 45 baud) in line 430.

COMPATIBILITY THROUGH COMPUTER DATING

COMMAND POST RTTY TX has been designed so that it can be merged directly with last month's RTTY receive program to give us a complete amateur RTTY terminal program. When this program is used in conjunction with last month's receive program, lines 420 and 430 must be deleted. Line 455 should be changed as noted in the REM statements in the program so that when the F1 function key is pressed it will toggle the program from send to receive and back again. Be sure to add line 185 to the receive program as indicated in the REM statements.

LET US BUILD ONE FOR YOU

It is possible to customize this program much as we did with COMMAND POST TX for CW transmitting. You can add preprogrammed messages and assign them to the remaining special function keys. By adding a sub-routine to check for these keys you will be able to send messages with a single key. Refer to the November 1983 COMMAND POST and see if you can implement this feature.

GETTING SHIFTY

The final step in getting on the air is to convert the TTL level computer code coming out of the VIC or C-64 on pin M into shifted audio tones corresponding to mark and space. Our interface will use the same integrated circuit used in many of the commercial interface units. The XR-2206 IC is available from many sources. One is included in the accompanying parts list. The XR-2206 is a very sophisticated waveform generator. For our use, the filters have been set to deliver a fairly pure sine wave signal. We set the two tones by adjusting the variable resistors connected to pins 7 and 8 of the chip. Normally, we will want to set them for 170 hertz shift, so we set the low tone at 2125 hertz and the high tone at 2295. Other combinations can be used, but these are the standards. It is recommended that the frequencies be adjusted using a frequency counter connected to the output of the chip (pin 2). The output from pin M on the user port should be fed to pin 9 on the XR-2206. Wiring is not critical. I built mine on a proto board. After correcting some questionable connections mine worked quite well. It is recommended that the interface be powered from a separate power source. Even a nine volt transistor battery will do to test the unit. A warning once again to those of you who insist on trying to power everything from the VIC or C-64 – DON'T DO IT! The amount of current available from the computer is quite low. You endanger not only your project but your computer as well when you draw too much current from the user port. All it takes is a momentary short – and "poof". For those of you asking about the availability of the user port connector, I have included a source for it as well in the parts list.

LOGGING WITHOUT TREES

One of the bookkeeping functions that our machines can do for us in the ham shack is logging our contacts of QSOs, as hams call them. It's great to have a virtually

instant "memory" afforded by an all electronic data base. In contests, computer logging and duplicate contact checking have become almost a necessity. Numerous articles have appeared over the past few years on performing these functions on many of the popular computers. Many are adaptable to the VIC and the 64.

If you are not big on handling data files and sorting routines, HAM DATA may have just the thing for you.

Chip Lohman, NN4U, is the programmer behind HAM DATA software. It is apparent from the end result that a lot of time and thought have gone into his programs. Let me concentrate on SUPER LOG IV for this discussion.

This is another program that will take some time to get used to. It took me about an hour to get accustomed to the necessary inputs and start to feel comfortable finding my way around the menus. The documentation is fair, but could give some more specific examples.

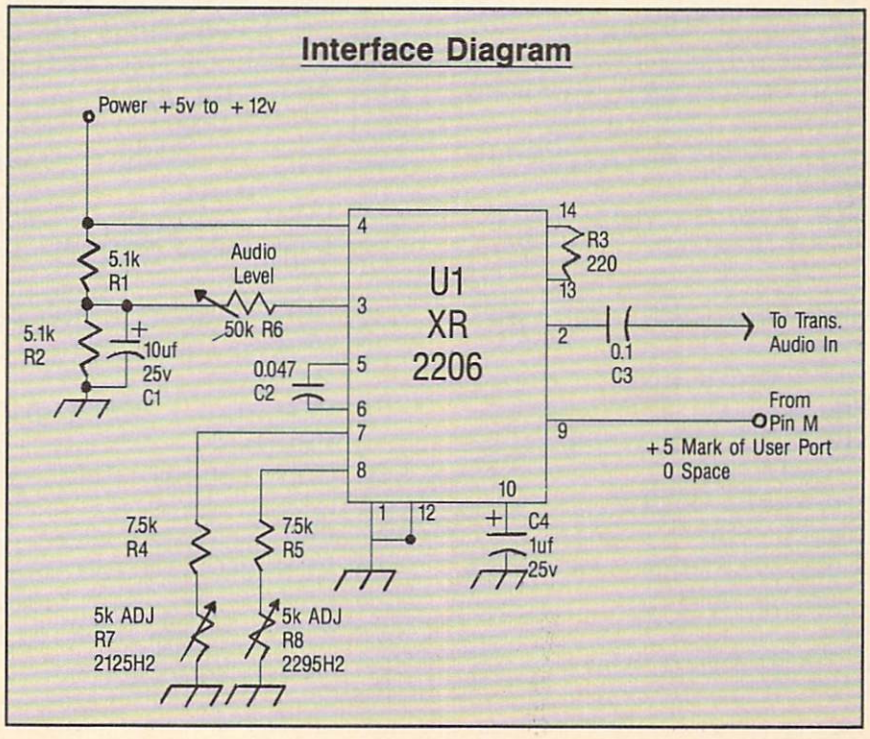
I used the C-64 version, though the program will work on a VIC-20 with a minimum of 8K expansion. The program is available for disk only. With a C-64 and SUPER LOG IV you can have approximately 525 files available at one time. With an 8K VIC that number drops to 88. The amount of memory used by the program itself is kept at a minimum by segmenting the various features into separate programs which are called by the main menu. While test driving the program I found all the loading to be a bit of a nuisance. In regular operation, where you would normally be logging and searching for long periods of time and only later printing the log or creating a summary of your contacts, the re-loading would be minimized. SUPER LOG is very picky about how you enter data–but most data base programs are.

But for these few drawbacks, SUPER LOG IV performs like a champ. It allows you to load your previously saved logging files. You can then view the file, one record at a time, or all of them at once. You can select entries that only show 40 meter contacts, a particular call sign, only people named Jim (or whoever), location, or a date of your choice. The login function is the work-horse where you input all of your QSO information. The change mode allows changes to be made to previously logged entries, but this is one of the auxiliary functions and requires the change routine to be loaded from disk. If you are into hunting states of DXCC countries, SUPER LOG IV will, with your help, keep your states and countries totals up to date.

One feature included is an alarm function. If you select auto-time where you enter the beginning time of the session, you will also be asked if you would like to set the alarm. Presumably, the alarm will remind you of dinner, your favorite TV show, or that your name is mud if your spouse doesn't see you by a certain time. The only problem is that you are only notified that you are "in alarm" when you return to the first prompt while logging. This is no problem during a contest, but if you are just making routine contacts, it could be quite some time before you make your next entry, assuring you a place in the doghouse!

You can print the entire log, or selected portions of it. You can even print the information part of a QSL (confirmation) card. That could be particularly handy if you find yourself on the DX end of pile-ups. Once again, the printing routines are auxiliary programs. The log must be saved and reloaded in order to use the printing functions.

I also took a quick look at CONTEST LOG, a three-in-one program for Sweepstakes, Field Day, and a universal program that will handle most of the other contest formats. These programs do all of your duplicate contact checking for you and even print your log when you are done! Unlike SUPER LOG, all features are available in one program. I can't wait for Field Day when I get to put this one to the



real test. CONTEST LOG is available for the VIC-20 with 8K expansion or the 64 on either disk or cassette. Suggested retail is $17.95 on cassette with a $3.50 additional charge for disk.

SUPER LOG IV retails for $21.95 on disk only for either VIC or the 64. More information is available from HAM DATA, 3331 Bybrook Lane, Woodbridge, Virginia 22192. If you are looking for a truly sophisticated logging program, SUPER LOG IV is highly recommended. For contests, CONTEST LOG is a good buy.

WAITING IN THE WINGS

The post office box usually contains correspondence from a COMMAND POST reader just about every day. Most of your comments so far though have concentrated on either very general information requests or questions specific to the columns that have already appeared. Now I'd like to know what you most would like to see covered in these pages. If you are short on ideas, here are a few currently being considered: creating video graphics for amateur TV, using the 64 as an audio-frequency waveform generator, a machine language CW receive program, transmission of computer programs over the air, repeater control. Several other topics are also being researched but will require a bit more "cooking" before they are ready to serve: SSTV reception, using the analog to digital converters available in the VIC and C-64 for interfacing to such things as antenna rotors, AMTOR reception and transmission, and packet radio. That's not a complete list, but it should get your mind started. Drop me a note and help determine the future contents of COMMAND POST. My address is: Jim Grubbs, K9EI, PO Box 3042, Springfield, Illinois 62708.

PARTS LIST

R1,R2 ----- 5.1 K ohm resistor
R3 ---------- 220 ohm resistor
R4,R5 ----- 7.5 K ohm resistor
R6 ---------- 50 K ohm single turn trim pot
R7,R8 ----- 5K ohm 10 turn trim pot

C1 ---------- 10uf 25v tantalum capacitor
C2 ---------- 0.047uf Mylar capacitor
C3 ---------- 0.1uf 50volt disc capacitor
C4 ---------- 1uf 25volt tantalum capacitor

U1 ---------- XR-2206 Exar integrated circuit

12/24 pin user port connector: Sullins 06SUL1224E5 available from:
Priority One Electronics
9161 Deering Avenue
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All other parts are avaialable from:
JAMECO Electronics
1355 Shoreway Road
Belmont, California 94002

```
410 PRINT''[clr][rvs-on][sp]COMM
    AND[sp]POST[sp]RTTY[sp]TX[s
    p]''
420 OPEN 2,2,0,CHR$(96+1)
430 POKE 665,211:POKE 666,87
440 L1$=''CYNIAMZTFKOR£LXVWJEPG
    ↑S]UQ''
441 F1$=''MDTIDZQORDDLC£]VWSAJP
    UGFXN↑DDDYD''
450 GET X$:IF X$=''''THEN GOTO
    430

452 IF X$=CHR$(34)THEN X$=CHR$(
    39)
455 IF X$='''' THEN END
460 PRINT X$;
461 IF X$=CHR$(13) THEN PRINT#2
    ,''H'';:GOTO 450
462 IF X$=CHR$(10)THEN PRINT#2,
    ''B'';:GOTO 450
469 IF X$=CHR$(32)THEN  PRINT#2
    ,''D'';:GOTO 450
470 X=ASC(X$)
471 IF X<33 THEN GOTO 450
```

```
472 IF X<65 THEN X=X-32:X$=CHR$
    (91)+MID$(F1$,X,1):PRINT#2,
    X$+CHR$(95);:GOTO 450
478 IF X>95 THEN GOTO 450
480 X=X-64:X$=MID$(L1$,X,1)
490 PRINT#2,X$;
500 GOTO 450
600 REM IF THIS PROGRAM IS USED
     WITH
610 REM COMMAND POST RTTY RX
620 REM THEN DELETE LINES 420 A
    ND 430
630 REM CHANGE LINE 455 TO
640 REM IF X$='''' THEN GOTO 26
    0
650 REM ADD LINE 185 TO THE RX
    PROGRAM
660 REM 185 IF A$='''' THEN GOT
    O 410
700 REM COMMAND POST RTTY TX
710 REM BY JIM GRUBBS
720 REM     PO BOX 3042
730 REM     SPRINGFIELD IL 62708
740 REM     (C) 1984
```

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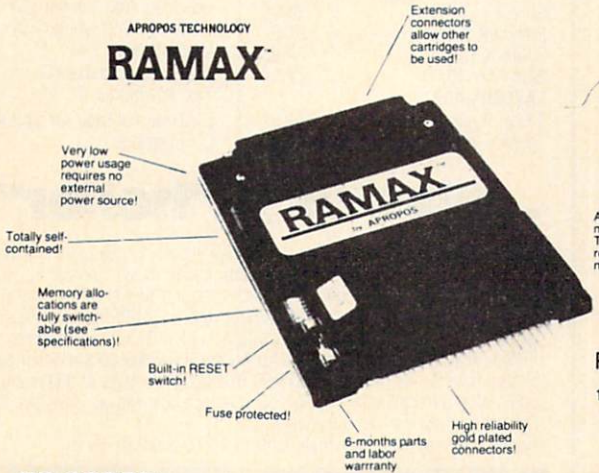
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  BLK 2 (8k: Adr. 16384-24575)
  BLK 3 (8k: Adr. 24576-32767)
  BLK 5 (Adr. 40960-49151, allows/disallows 8k ROM games)
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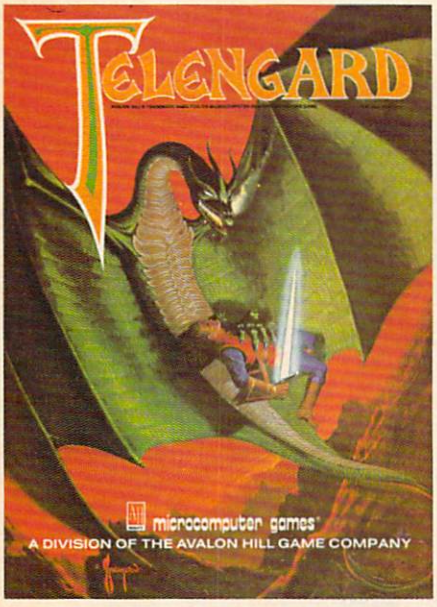

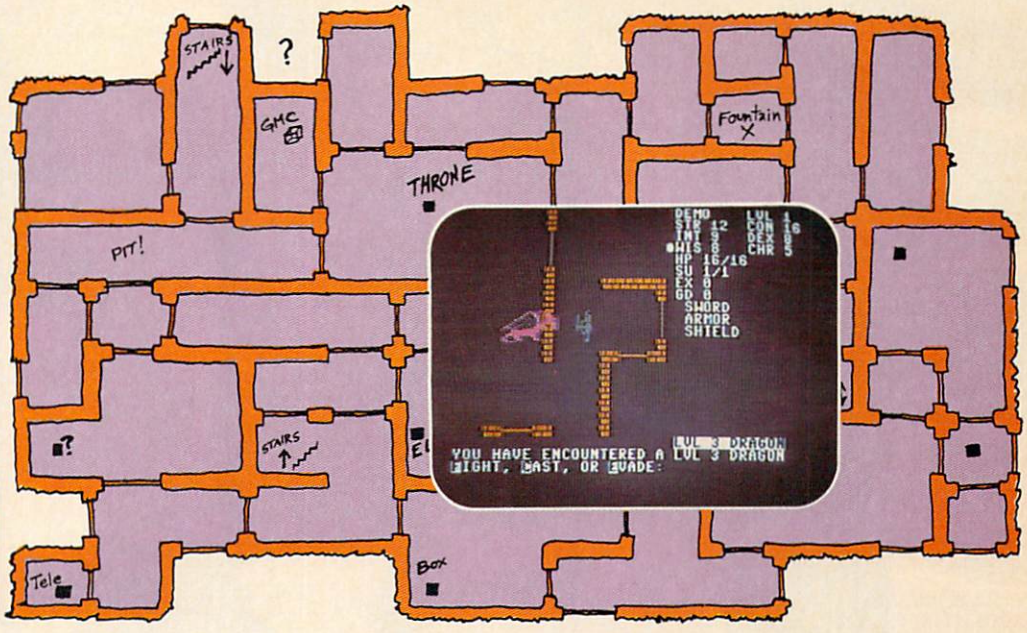

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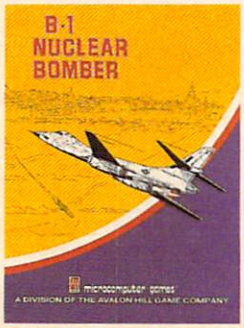

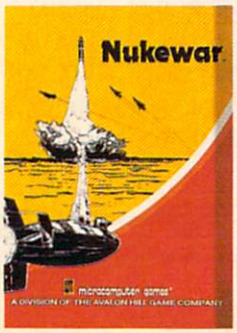

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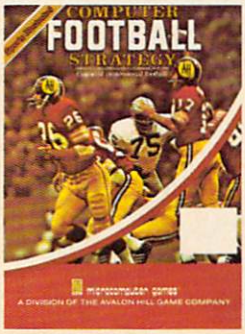

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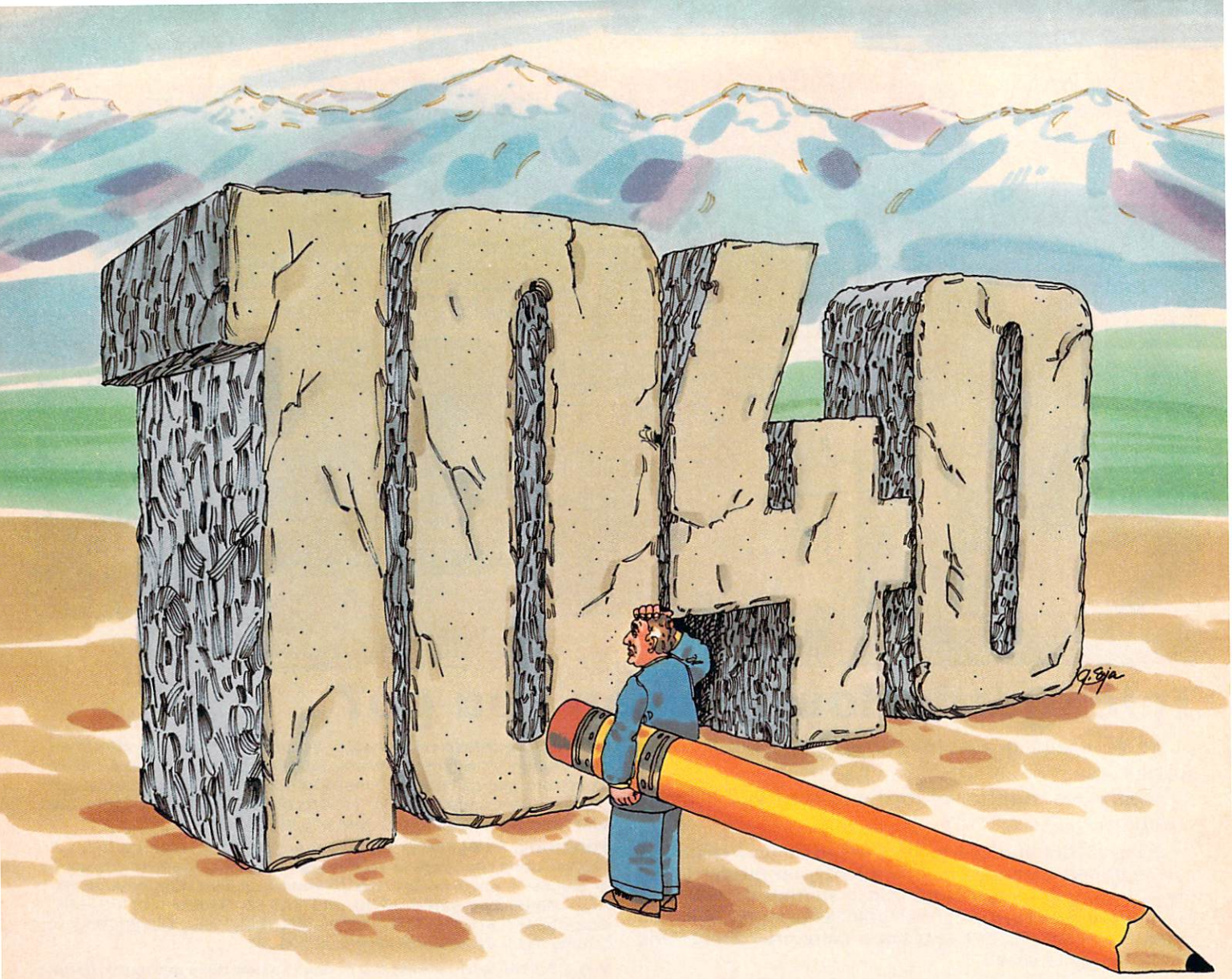

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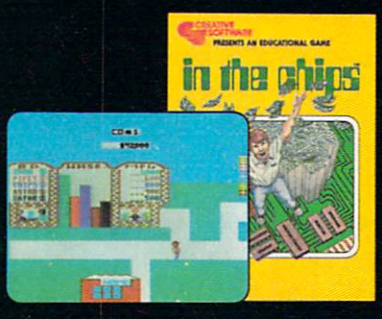

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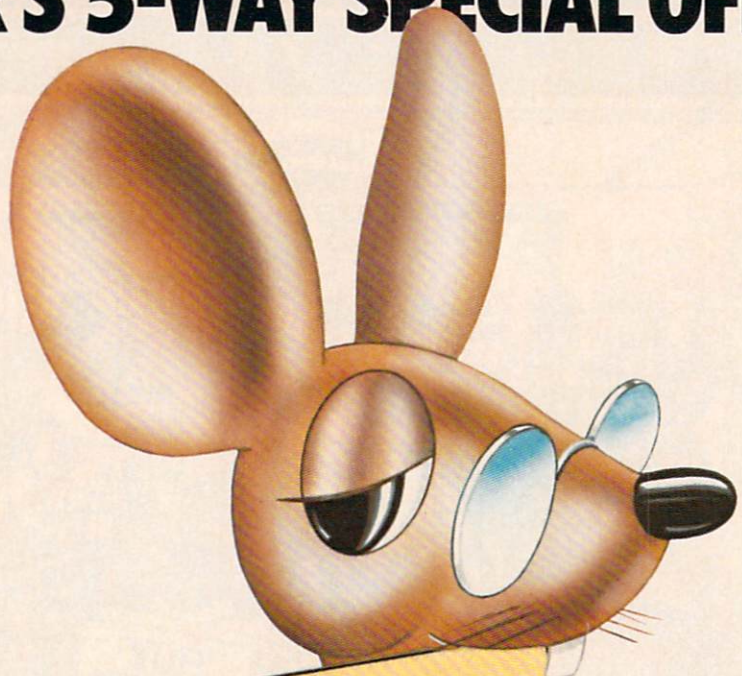

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B*A*S*I*C Training

By Jonathan Secaur

Last month our hands-on, self-teaching course in Commodore BASIC introduced the PRINT statement and the concept of numeric variables. This lesson focuses on another, important type of variable that is used for "character strings."

Lesson 2

VARIABLES AND MORE VARIABLES

In Lesson 1 you learned that a letter or a group of characters starting with a letter make up a **numeric variable,** a symbol that stands for a number. Most microcomputers only recognize two-character variable names, and the first must be a letter. A, RV, and Z1 are some examples.

1) Put a T by each set of letters or numbers that could be a numeric variable, and an F by each that could not be.

_____ET

_____C3PO

_____K9

_____3D

_____Q

_____29

2) Now you know how to let something stand for a number in BASIC, but we also need something to stand for a *name* or other *words.*

Here's an important definition: anything in quotes is called a **string.** Your name (inside quotes), your address (inside quotes), anything at all inside quotes is a string. That's short for saying it's a string of characters, or a character string.

If we use numeric variables to stand for numbers, you can guess that we use **string variables** to stand for strings. A string variable is written just like a numeric variable, except that string variables always end with a string sign, $. That's the same thing as a dollar sign, but it has nothing to do with money. When you see that symbol, just read the word "string."

Some possible BASIC string variables would be A$, ZZ$, B1$, and even SHOE$ or KITE$. (If you missed the jokes, please read the previous paragraph again!)

To see how it works, type in these lines, pressing [RETURN] after each line:

```
NAME$ = "[type your name here]" (actually put your
   name between the quotes)
PRINT NAME$
```

and the computer will be glad to print out your name.

3) You can save some time and space by typing more than one command on a line if you put a colon (:) between the statements to separate them. Try this one:

```
A$ = "CAR":B$ = "NATION":PRINT A$ + B$
   (remember to press [RETURN])
```

If you ask the computer to PRINT 4+3, it will give you the sum, 7. How can it add two words together? As you can see, it just sticks them together with no space in between. Adding two strings together is called **concatenating** them. Next time someone asks you what you've learned about computers, tell them you know how to "concatenate strings," and they will surely be impressed.

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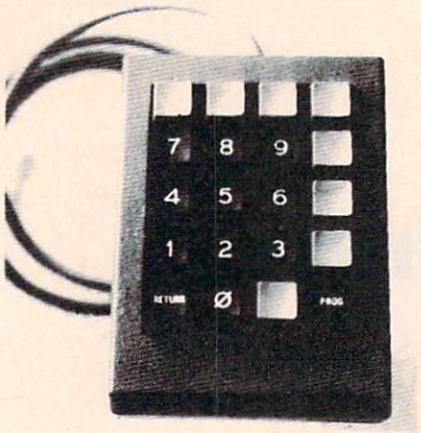

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You could make the computer leave a space between the two words if you include a space between them somewhere, in quotes. You could say,

```
A$ = "CAR":B$ = "NATION":PRINT A$ + " " + B$
```

4) If you use a string variable (a variable name followed by a $), you must set it equal to something in quotes. If you use a numeric variable, you must let it equal a number.

See what happens if you don't, by typing in these lines:

```
A$ = ANGELFOOD
A = "5"
```

What does the computer say if you use the wrong kind of variable?

---

6) By the way, since the computer reads from left to right, the variable name must always be on the left side of the equals sign.

You can say USEDCAR = 1975, but not 1975 = USEDCAR.

See you next time.

Answers to Lesson 2 Questions:

1) T, T, T, F, T, F

4) ?TYPE MISMATCH ERROR That just means that the information you supplied was not the same kind, or of the same type, as the variable used.

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BASIC Education: Programming for Learning
Part IV-Getting into Inputs

By Andy Van Duyne

IN SEARCH OF A BETTER MOUSE . . .

All good educational software requires some sort of input from the user. There are a number of alternative input sources: joysticks, graphics pads, paddles, light pens, "mice," and even the voice. Unfortunately, most students are left to do battle with a woefully inferior device–the keyboard. Due to the many frailties of the QWERTY (standard typewriter keyboard) system, this haphazardly arranged device is probably the single greatest impediment to enjoyable and efficient computer use. Even experienced typists are always vulnerable to "typos", and young users often spend much time in the frustrating pursuit of the right key. Commodore has tried to make things easier for VIC-20 and C-64 users by including those large, isolated function keys–but try to explain their numbering to a youngster. (I have found that, to get any real use out of them with kids, it was necessary to cover the keys with some kind of label, transforming them to 1-2-3-4 or A-B-C-D). Anyway, most of us have just the keyboard with which to work, and we must make the best of the situation.

One good thing about the keyboard as an input device is its universality–virtually every computer has one. A programmer trying to write for a number of unknown future users can almost certainly rely on this device as being part of the setup!

MELODIC INPUTS

It is good practice to design your input techniques to minimize common mistakes, and accept only "correct" responses. Let's look at a few techniques by writing a program to give the user practice in "ear training." A short melody (5 notes) will be played, then the user must enter the scale degree or note (nos. 1-8) in the proper sequence, one at a time. The user can also choose to hear the "mystery tune" or the major scale at any time. We want to create an input routine to satisfy the following specifications:

1. The numbers 1-8, standing for pitches, will be accepted as input. [RETURN] must be pressed for the answer to be finally entered. This will allow the user to think about an answer and change it if desired.
2. By pressing "T" alone, the mystery tune will be played. ([RETURN] not required)
3. By pressing "S", the major scale will be played to help the user establish the tonality of the tune. (Again, without [RETURN])
4. By pressing the [DELETE] key, a response may be cleared so that another can be entered.

Let's examine some of our options:

User input from the keyboard can take several forms-numbers, letters, words, single keypresses, control functions (on the C-64), and special characters, such as delete, back arrow or the function keys. Perhaps the weakest (though simplest) input technique is this:

```
INPUT X
```

Of course, you know that this is looking for a number. You can carefully print a screen message to the effect of "ENTER A NUMBER FROM 1-8." You may also know, if you have done this for any period of time, that kids (and even adults) will hit one of the nearby letter keys instead of a number with annoying frequency–"Q" instead of the "1", for example. This results in the all-too-familiar "REDO FROM START" message, and often the scrolling of the text, obliterating your carefully designed and beautifully prepared screen. This is because the response to an INPUT statement is PRINTed on the screen, even before you touch [RETURN].

One solution to this problem is to use a string variable input:

```
INPUT X$
X=VAL(X$)
```

Under these conditions, the errant letter "Q"would not result in the error condition, but would return a value of zero for the variable X. This solves part of the problem, and we can pick up the letters "S" and "T", but still allows for plenty of accidents. What happens, for example, if the student hits the [HOME] key, or [CLR], or those infernal repeating cursor keys. There goes your nice screen! The INPUT statement also cannot read the function keys, should you want them to be used.

There is also the possibility of PEEKing at address 197, which will return a value for the current key being pressed. This would be a bit convoluted, however, especially in handling the RETURN requirement of our first specification.

DO NOT FORGET "GET"

As you may have guessed, the core of the input routine we will develop is the GET statement. Perhaps the most common use of this statement is as follows:

```
100 PRINT "TOUCH A KEY TO CONTINUE"
110 GETA$: IF A$= "" THEN 110
```

The GET statement takes a quick glance at a particular input device. In this example, it looks at the default device, or the keyboard. If, at the time the statement takes the look, there is a value being generated (in this case, a code being returned from a pressed key), that value is assigned to the variable. This method of

securing input is very useful when working with young children, as it requires less keyboard manipulation. Using GET and string variables, we can read ANY key on the keyboard, including the cursors, delete, and function keys. Unlike the INPUT statement, GET does not print its character on the screen–meaning that [HOME], [CLR], and the cursors can be pressed without destroying your carefully planned screen. But this also means that we have to do a little more work in the input routine, so that the user does not end up typing "blind".

Before using a GET statement, you should always include the following:

POKE 198, 0

This clears the keyboard buffer. Often a user becomes either impatient or excited, and will press a key a number of times to enter just one response. When the GET statement looks at the keyboard, it actually checks the bottom address of the keyboad buffer (a section of memory that stores multiple keypresses.) The GET statement will take it instead of the most recent keypress, which will be topmost in the buffer.

THE WHOLE INPUT ROUTINE

An annotated version of the recommended routine is shown in Figure 1.

This routine fits our specifications, and prohibits the entry of any erroneous values. About the only thing a user can do to crash this routine would be to press the RUN/STOP key, which can be defeated elsewhere in the program if desired. While this particular configuration was designed for the accompanying programs, the techniques can be applied to any number of situations. One note–the DELETE function is not really required in this case, as the variable AN$ is always updated to equal the latest valid entry. It is a good idea to include it, though, as it will be required when this routine is expanded to handle answers which are longer than one character.

Remember, the goal of an "educational" program is NOT to confound and frustrate the user with beastly input routines. Given the shortcomings of the keyboard, the program should do as much as possible to help the user to be successful in demonstrating knowledge of the subject matter. It should not be a drill on typing skills.

If you have any comments or suggestions about this series, please send them to me in the care of *COMMANDER* Magazine. 'Til next time. . .

```
200 REM INPUT ROUTINE
201 POKE 198,0 : PRINT D$SP$D$ "WHICH STEP? "AN$
     (clear buffer- clear screen sPace-Place
     messa9e-Print current answer value)
202 GET A$ : IF A$ ="" THEN 202
     (check for keyPress- looP if none)
203 IF A$ = CHR$(13) THEN 209 (check for RETURN)
204 IF A$ = "T" THEN GOSUB 220 : AN$= "": GOTO 201
     (intercePt tune request:clear answer- relooP)
205 IF A$ = "S" THEN GOSUB 230 : AN$= "": GOTO201
     (intercePt scale reQuest:clear answer- relooP)
206 IF A$ = CHR$(20) THEN AN$= "" : GOTO 201
     (check for delete key - clear answer- relooP to
          Print messa9e)
207 IF A$ < "1" OR A$ >"8" THEN 202
     (check for any other invalid key)
208 AN$ = A$ : GOTO 201
     (accePt Pressed key as the answer- relooP to 9et
      either RETURN or DELETE)
209 IF AN$ = "" THEN 201
     (check for null strin9 as answer)
210 RETURN (everythin9 is O.K.- return with this value
      for AN$)
```


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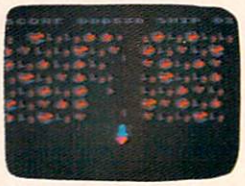

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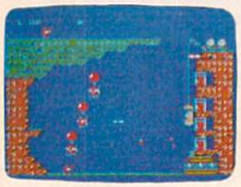

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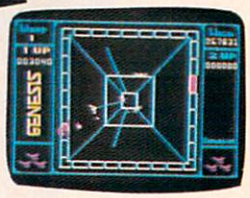

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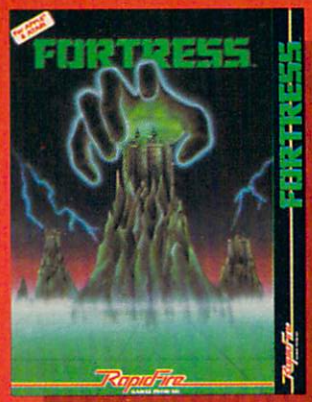

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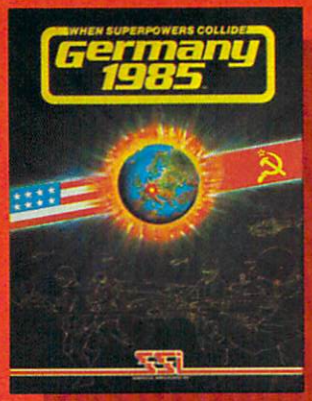

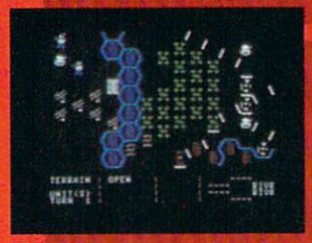

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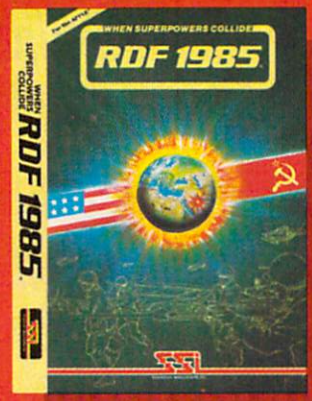

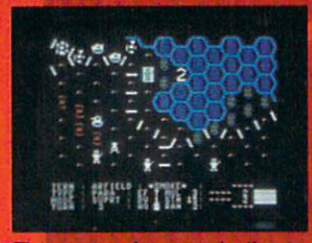

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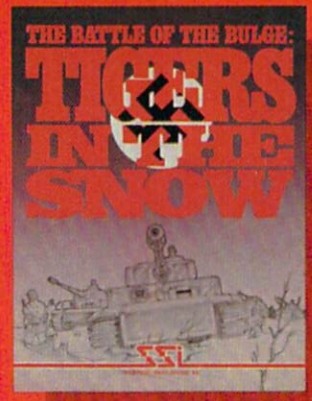

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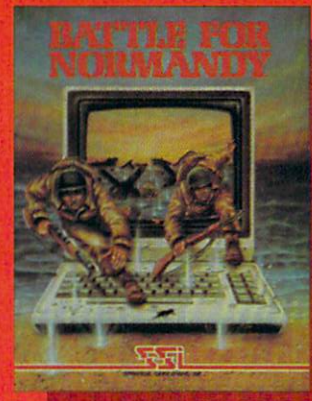

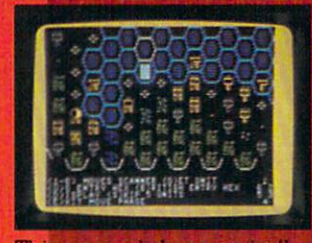

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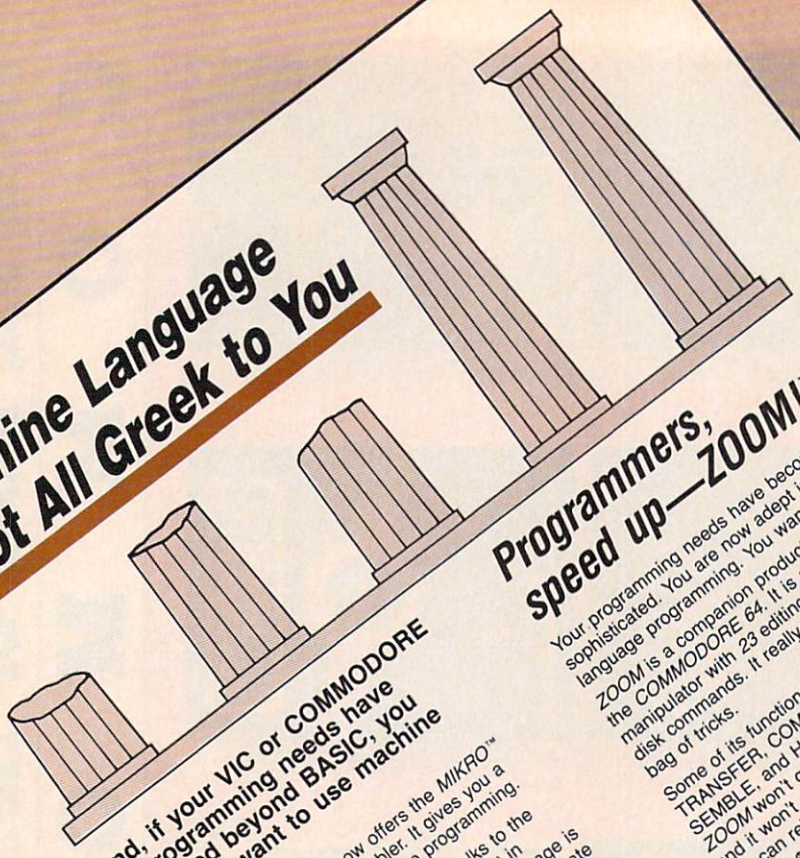

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Circle No. 210

Ears – VIC-20 Version

```
10 REM EARS (VIC)

12 X=RND(-TI)

20 PRINT''[clr]''SPC(207)''EAR
   S''SPC(100)''BY[sp]ANDY[sp]
   VAN[sp]DUYNE''

21 FORP=1TO2E3:NEXT:PRINT''[do
   wn, 3 times]TOUCH[sp]A[sp]K
   EY...''

22 GETA$:IFA$=''''THEN22

30 REM SETUP STRINGS

31 D$=''[home][down, 16 times]
   '':SP$=''[sp, 21 times]''

35 E$=''[clr][rvs-on][sp, 9 ti
   mes]EARS[sp, 9 times]''

40 REM SETUP SOUND

42 S=36876:POKES,0:POKES+2,15

43 DIM T%(5),A%(5),P%(8)

44 FORN=1TO8:READP%(N):NEXT

46 DATA201,207,212,215,219,223
   ,226,228

48 GOSUB250

50 REM GET FIRST NOTE

52 PRINT''[clr][down, 3 times]
   SHOULD[sp]THE[sp]FIRST[sp]
   NOTE[sp, 3 times]BE[sp]SCA
   LE[sp]STEP[sp]#1?''

53 PRINT''[down]1.[sp]YES'':PR
   INT''[down]2.[sp]MAYBE'':PR
   INT''[down]3.[sp]NO[down, 3
    times]''

55 INPUTA$:IFA$<''1''ORA$>''3''
   THEN52

56 IFA$=''1''THENT%(1)=1

57 IF(A$=''3'')AND(T%(1)=1)THE
   NGOSUB250:GOTO56

90 PRINTE$

100 REM MAIN LOOP
```

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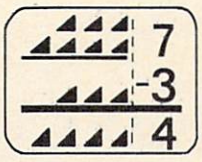

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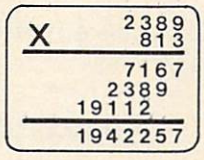

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```
102 TR=0:GOSUB230:GOSUB290:GOSU
    B220:GOSUB290

104 FORR=1TO5:GOSUB310:GOSUB300

106 AN$=""":GOSUB200:TR=TR+1

108 IFVAL(AN$)<>T%(R)THENGOSUB2
    70:GOTO106

110 GOSUB 275:NEXT:GOSUB300:GOS
    UB290

120 REM FINISHED

122 GOSUB320

124 PRINTE$

126 PRINT""[down][sp, 3 times]*
    *[sp]REPORT[sp]CARD**

128 PRINT""[down, 2 times]YOUR[
    sp]TOOK[sp]""TR""TRIES""

130 PRINT""[sp, 2 times]TO[sp]G
    ET[sp]THE[sp]5[sp]NOTES.""

132 PRINT""[down, 2 times]FINAL
    [sp]SCORE:"";

134 SC=INT((5/TR)*100+.5):PRINT
    SC

136 PRINT""[down, 2 times]WANT[
    sp]ANOTHER?[sp](Y/N)

138 GETA$:IFA$=""Y""THENRUN30

140 IFA$=""N""THEN150

142 GOTO138

150 REM DONE

152 PRINT""[clr][down, 2 times]
    THANKS[sp]FOR[sp]PLAYING!""
    :CLR:END
200 REM INPUT ROUTINE

201 POKE198,0:PRINTD$SP$D$""WHI
    CH[sp]STEP[sp]?"" AN$

202 GETA$:IFA$=""""THEN202

203 IFA$=CHR$(13)THEN209

204 IFA$=""T""THENGOSUB220:AN$=
    """":GOTO201

205 IFA$=""S""THENGOSUB230:AN$=
    """":GOTO201

206 IFA$=CHR$(20)THENAN$="""":G
    OTO201

207 IFA$<""1""ORA$>""8""THEN202

208 AN$=A$:GOTO201

209 IFAN$=""""THEN201

210 RETURN

220 REM PLAY TUNE

221 PRINTD$SP$D$""HERE[sp]IS[sP
    ]THE[sp]TUNE...""


222 FORN=1TO5

224 PI=P%(T%(N)):GOSUB260:NEXT

226 RETURN

230 REM PLAY SCALE

232 PRINTD$SP$D$""HERE[sp]IS[sP
    ]THE[sp]SCALE...""

234 FORN=1TO8:PI=P%(N):GOSUB260
    :NEXT

236 RETURN

250 REM GEN TUNE

251 FORN=1TO5:T%(N)=0:NEXT

252 FORN=1TO5


254 Z=INT(RND(1)*5)+1:IFT%(Z)<>
    0THEN254

256 T%(Z)=RND(1)*8+1:NEXT

258 RETURN

260 REM PLAY NOTE

262 POKES,PI

264 FORP=1TO500:NEXT

266 POKES,0:RETURN

270 REM WRONG ANS
```

```
272 PRINTD$SP$D$''NO,[sp]THAT[s
    p]IS[sp]NOT[sp]IT'':GOSUB29
    0:GOSUB220:RETURN

275 REM RIGHT ANS

276 FORQ=150TO240 STEP5:POKES,Q
    :NEXT:POKES,0

277 PRINTD$SP$D$''RIGHT!!!!'':G
    OSUB290:RETURN

290 FORP=1TO2E3:NEXT:RETURN

300 REM UPDATE SO FAR

302 SF$=SF$+''[sp]''+AN$

304 PRINT''[home][down, 4 times
    ]''SP$''[home][down, 4 time
    s]SO[sp]FAR:''SF$

306 RETURN

310 REM NOTE NUMBER

312 PRINT''[home][down, 2 times
    ]''SP$''[home][down, 2 time
    s]NOTE[sp]NUMBER''R

314 RETURN

320 REM FINISHED SOUND

322 FORN=1TO3:FORZ=250TO150STEP
    -4

324 POKES,Z:NEXTZ,N:POKES,0

326 RETURN
```

EARS–C-64 Version

```
 10 REM EARS (64)
 12 X=RND(-TI)
 20 PRINT''[clr]''SPC(217)''EAR
    S''SPC(110)''BY[sp]ANDY[sp]
    VAN[sp]DUYNE''
 21 FORP=1TO2E3:NEXT:PRINT''[do
    wn, 3 times]TOUCH[sp]A[sp]K
    EY...''
 22 GETA$:IFA$=''''THEN22
 30 REM SETUP STRINGS
 31 D$=''[home][down, 19 times]
    '':SP$=''[sp, 39 times]''
 35 E$=''[clr][rvs-on][sp, 17 t
    imes]EARS[sp, 19 times]''
 40 REM SETUP SOUND
 41 DIM T%(5),P%(8)
 42 S=54272:FORN=ST054295:POKEN
    ,0:NEXT:POKEN,15
 43 POKES+2,0:POKES+3,8:POKES+5
    ,15:POKES+6,255
 44 FORN=1TO8:READP%(N):NEXT
 46 DATA4817,5407,6069,6430,721
    7,8101,9094,9634
 48 GOSUB250
 50 REM GET FIRST NOTE
 52 PRINT''[clr][down, 3 times]
    SHOULD[sp]THE[sp]FIRST[sp]
    NOTE[sp]BE[sp]SCALE[sp]STE
    P[sp]#1?''
 53 PRINT''[down]1.[sp]YES'':PR
    INT''[down]2.[sp]MAYBE'':PR
    INT''[down]3.[sp]NO[down, 3
     times]''
 55 INPUTA$:IFA$<''1''ORA$>''3''
    THEN52
 56 IFA$=''1''THENT%(1)=1
 57 IF(A$=''3'')AND(T%(1)=1)THE
    NGOSUB250:GOTO56
 90 PRINTE$
100 REM MAIN LOOP
102 TR=0:GOSUB230:GOSUB290:GOSU
    B220:GOSUB290
104 FORR=1TO5:GOSUB310:GOSUB300
106 AN$='''':GOSUB200:TR=TR+1
108 IFVAL(AN$)<>T%(R)THENGOSUB2
    70:GOTO106
110 GOSUB 275:NEXT:GOSUB300:GOS
    UB290
120 REM FINISHED
122 GOSUB320
124 PRINTE$
126 PRINT''[down][sp, 11 times]
    **[sp]REPORT[sp]CARD**
128 PRINT''[down, 2 times]YOUR[
    sp]TOOK[sp]''TR''TRIES''
130 PRINT''[sp, 2 times]TO[sp]G
    ET[sp]THE[sp]5[sp]NOTES.''
132 PRINT''[down, 2 times]FINAL
    [sp]SCORE:'';
134 SC=INT((5/TR)*100+.5):PRINT
    SC
136 PRINT''[down, 2 times]WANT[
    sp]ANOTHER?[sp](Y/N)
138 GETA$:IFA$=''Y''THENRUN30
140 IFA$=''N''THEN150
142 GOTO138
150 REM DONE
152 PRINT''[clr][down, 2 times]
    THANKS[sp]FOR[sp]PLAYING!''
    :CLR:END
200 REM INPUT ROUTINE
201 POKE198,0:PRINTD$SP$D$''WHI
    CH[sp]STEP[sp]?'' AN$
```

```
202 GETA$:IFA$=''''THEN202

203 IFA$=CHR$(13)THEN209

204 IFA$=''T''THENGOSUB220:AN$=
    '''':GOTO201

205 IFA$=''S''THENGOSUB230:AN$=
    '''':GOTO201

206 IFA$=CHR$(20)THENAN$='''':G
    OTO201

207 IFA$<''1''ORA$>''8''THEN202

208 AN$=A$:GOTO201

209 IFAN$=''''THEN201

210 RETURN

220 REM PLAY TUNE

221 PRINTD$SP$D$''HERE[sp]IS[sP
    ]THE[sP]TUNE...''

222 FORN=1TO5

224 PI=P%(T%(N)):GOSUB260:NEXT

226 RETURN

230 REM PLAY SCALE

232 PRINTD$SP$D$''HERE[sp]IS[sP
    ]THE[sP]SCALE...''

234 FORN=1TO8:PI=P%(N):GOSUB260
    :NEXT

236 RETURN

250 REM GEN TUNE

251 FORN=1TO5:T%(N)=0:NEXT

252 FORN=1TO5

254 Z=INT(RND(1)*5)+1:IFT%(Z)<>
    0THEN254

256 T%(Z)=RND(1)*8+1:NEXT

258 RETURN

260 REM PLAY NOTE

261 P1=INT(PI/256):P2=PI-256*P1

262 POKES,P2:POKES+1,P1:POKES+4
    ,65

264 FORP=1TO500:NEXT

265 POKES,0:POKES+1,0:POKES+4,6
    4

266 RETURN

270 REM WRONG ANS

272 PRINTD$SP$D$''NO,[sP]THAT[s
    P]IS[sP]NOT[sP]IT'':GOSUB29
    0:GOSUB220:RETURN

275 REM RIGHT ANS

276 POKES+4,65:FORQ=30TO80STEP4
    :POKES,0:POKES+1,Q:NEXT

277 POKES+1,0:POKES+4,64

278 PRINTD$SP$D$''RIGHT!!!!'':G
    OSUB290:RETURN

290 FORP=1TO2E3:NEXT:RETURN

300 REM UPDATE SO FAR

302 SF$=SF$+''[sp]''+AN$

304 PRINT''[home][down, 4 times
    ]''SP$''[home][down, 4 time
    s]CORRECT[sP]SO[sP]FAR:''SF
    $

306 RETURN

310 REM NOTE NUMBER

312 PRINT''[home][down, 2 times
    ]''SP$''[home][down, 2 time
    s]NOTE[sP]NUMBER''R

314 RETURN

320 REM FINISHED SOUND

322 FORN=1TO3:POKES+4,65:FORZ=1
    00TO50STEP-2

324 POKES+1,Z:NEXTZ,N:POKES+1,0
    :POKES+4,64

326 RETURN
```

Explorations with Assembly Langauge

DIS/MON

By Eric Giguere

Welcome to the first installment of my new column. Those of you who have been following my previous series ("An Introduction to Assembly Language") should now be ready to start working with more advanced concepts. "Explorations With Assembly Language" assumes you have an elementary knowledge of 6502/6510 assembly language. For those of you who are interested in assembly language but do not know where to start, I suggest you buy a book on the subject or order back issues of *COMMANDER*.

WITH OR INTO?

I had at first considered naming this column "Explorations *Into* Assembly Language" but then decided to replace the "Into" with "With." Why? Because we are not only going to learn more about programming in assembly language, but we are also going to explore the insides of the computer. We are going to look at how assembly language is used to make the computer "tick"– from the BASIC language to the Input/Output (I/O) routines, all from the assembly language point of view.

THE TOOL OF THE TRADE

Before we can start exploring, we need some kind of tool to aid in our explorations. Most of the things we will do require the use of a machine-language monitor and a disassembler (I am assuming you know what these are by now). Some of you may have at least one of these already, as there are several good ones available. In case you do not, I am including here the program DIS/MON, a combination disassembler/monitor (the proper term is really "extended monitor"). Written in BASIC, and hence a trifle slow, it works both on the VIC-20 and the C-64.

Typing in DIS/MON should be fairly straightforward. You can omit all the REM statements as no GOTOs or GOSUBs are made to them. VIC owners will have to plug in their 8K (or larger) RAM expansion cartridge (you do have one, do you not?) and fix-up the PRINT statements at the beginning of the program so that they fit on the 22-column screen. And if you do not feel like typing in the program, you can obtain a copy of it through COMMANDER's "Tapes on Command" offered elsewhere in this issue.

USING DIS/MON

Once you have typed DIS/MON in, enter the magic word RUN and press [RETURN]. On the bottom left-hand side of the title screen, you will see a bracket and a flashing cursor. DIS/MON is now waiting for you to enter one of twelve commands: A, C, D, G, L, M, P, R, S, X, : or Z. To enter a command, type the command letter, a space, and the parameters needed (explained below). Press [RETURN] and DIS/MON will execute the command (providing everything is in order). If you make a typing mistake, you can use the INST/DEL key to delete the preceding character(s) and type the correct sequence. Following are the descriptions and instructions for each command.

(A)SCII

The command A is used to display the ASCII values of specified memory locations. The command A must be followed by two four-digit hexadecimal numbers (all numbers in DIS/MON are in hex), each separated by a blank space. The first digit is the starting address and the second is the ending address. Upon pressing [RETURN], DIS/MON will display all the ASCII values of the bytes from the starting to the ending addresses. For example:

]A 033C 033F

will display the ASCII values of the bytes $033C-$033F. The bytes are displayed 16 at a time, in reverse text, preceded by a four-digit hex number showing the first byte in the line. Please note that the reversed quote (") character you see at the start of each line is not an actual ASCII value–it is there only to make sure certain ASCII characters will show up on the screen. If you select the P ON option, the ASCII values will be sent to the printer instead of the screen.

Why display ASCII values? A lot of times messages are stored into memory in ASCII form. This command can be used to show us what these messages are without having to resort to cumbersome ASCII conversion charts. For an interesting peek at BASIC type the following on the VIC:

]A C000 C100

or on the C-64:

]A A000 A100

You will only see garbage at first, but then it gets more interesting. (Can you figure out what they are? Try switching character sets by pressing the shift and Commodore keys.) When using the ASCII command, holding down a key freezes the listing, while pressing the space bar aborts it completely and returns you to the command mode.

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(C)atalog

This is only for those users with disk drives. Pressing C and [RETURN] gives you a catalog or directory–the list of all the programs on the current disk in the drive. Pressing a key will freeze the catalog and pressing the space bar aborts it completely.

(D)isassemble

This is a powerful command: it disassembles assembly language code. What this means is that arcane hex numbers are converted into the more easily understood assembly language instructions that we know and love, such as LDA #$F4 and JMP ($Ø33C). To use it, simply type the starting and ending addresses of the memory locations you wish disassembled, as in:

]D FFD2 FFFF

which will proceed to disassemble all the memory from $FFD2 to $FFFF. At any time during the disassembly, you may freeze the listing by holding a key or abort it by pressing the space bar. If the printer option is on, the listing will go to the printer.

If a byte to be disassembled is a non-existent assembly language instruction it will be displayed on screen as three asterisks–***. This means you have wandered somewhere where there are no instructions. You will see a few occasionally, but these will mostly be random combinations. We will talk some more about this in a later column.

(G)oto

The G command is very simple: it allows you to start executing a machine language program in memory. Simply type G and the starting address. Example:

]G FFD2

would execute the program starting at $FFD2.

(L)oad

L is used to load a machine-language program into memory. Type L, a space, the filename of the program in between apostrophes, and the device number from which you want to load the program. Example:

]L 'EXAMPLE PROG',Ø8

would load EXAMPLE PROG from device 8 (the disk drive). Tape users would use

]L 'EXAMPLE PROG',Ø1

If you do not specify a device number it will be assumed to be the disk, 8.

Notice that the filename is to be enclosed within apostrophes ('). Usually we use quotes (") but these can sometimes affect the screen in funny ways. Rather than go through the hassle of dealing with them, DIS/MON automatically changes SHIFT-2 (") to SHIFT-7 (') each time you press that particular combination. This means that you can type out L "EXAMPLE PROG" and on the screen it will show as L 'EXAMPLE PROG'.

(M)emory Display

The M command is just like the A command except that it displays the true hex values of the bytes and not their ASCII representations. The command

]M Ø33C Ø33F

will display the values of the four bytes from $Ø33C-$Ø33F. As in the ASCII command, hitting a key freezes the display while pressing the space bar aborts it. If the printer option is chosen output is sent to the printer instead of the screen.

(P)rinter ON/OFF

This command is used to direct output to the screen or printer. Type P, a space, and the word 'ON' or 'OFF'. 'ON' turns on the printer–i.e., most commands will send their output to the printer. 'OFF' turns off the printer and directs output to the screen. When DIS/MON is first run, the printer is in the OFF mode. This command is useful for getting printed copies for later study.

(R)egister Display

The R command displays the current values of the three important registers: the accumulator (AC), the X-register (XR) and the Y-register (YR).

(S)ave

S is the opposite of L: it stores machine-language programs in memory. Use the same syntax as L but follow the device number by the starting and ending addresses of the program, separated by a comma. Example:

]S 'EXAMPLE PROG',Ø8,Ø4ØØ,Ø8ØØ

Always add 1 to the actual ending address so that the last byte will be saved. Once again, cassette users may replace Ø8 with Ø1 for the device number.

e(X)it Program

X is used to quit the program and exit to BASIC. Simply type X and press [RETURN]. If you wish to return to DIS/MON intact, type GOTO 2ØØ.

(:)-Change memory

The : (colon) command is used to store new values into memory. Type :, the starting address, a blank space, and the two digit values to be stored. Example:

]:Ø33C 6Ø ØØ FF FF ØØ

would store the five bytes $6Ø,$ØØ, $FF,$FF and $ØØ into memory starting at $Ø33C. If you then did a M Ø33C Ø34Ø you would see these bytes displayed.

There is only one limitation to this command: you cannot store bytes within the DIS/MON program space itself. This is so that you do not crash the computer while playing around.

(Z) send disk command

The Z command has no relation to its purpose, but that is OK. Follow Z by the disk command enclosed in apostrophes and it will automatically be transmitted to the disk drive. Example:

]Z 'S:EXAMPLE PROG'

would send S:EXAMPLE PROG to the drive. If you type 'E' as the disk command DIS/MON will instead read and display the error channel message. Example:

]Z 'E'

HOW IT WORKS

DIS/MON is basically a simple program. If you have typed in my EDIT/ASM and BASICMON programs from previous issues you will see many similarities. In fact, if you have a BASIC extension utility you could load in the EDIT/ASM assembler module and delete all the lines up to 8999. This would leave you the DATA statements from 9ØØØ on and save you quite a bit of typing (they are exactly the same in both EDIT/ASM and DIS/MON). Once DIS/MON recognizes a command it goes to the appropriate routine and returns when finished. The important program sections are

```
  1Ø -  19Ø Initialization
 2ØØ -  24Ø Fetch command
 5ØØ -  56Ø A routine
1ØØØ - 113Ø C    "
1 5ØØ - 177Ø D    "
2ØØØ - 2Ø1Ø - G   "
2 5ØØ - 254Ø L    "
3ØØØ - 3Ø6Ø M    "
3 5ØØ - 352Ø P    "
4ØØØ - 4Ø2Ø R     "
4 5ØØ - 457Ø S    "
      5ØØØ X      "
5 5ØØ - 553Ø :    "
6ØØØ - 6Ø2Ø Z     "
7ØØØ - 7Ø1Ø Error messages
7 5ØØ - 751Ø Get disk status
7 6ØØ - 762Ø Print disk status
7 7ØØ - 777Ø Get filename and
             device #
8ØØØ - 8Ø8Ø Input routine
8Ø9Ø - 811Ø Get two hex values
8 5ØØ - 852Ø Hex to decimal
             converter
8 53Ø - 858Ø Decimal to hex
             converter
9ØØØ - 999Ø Data for disassembly
```

You should have fun analyzing this program!

NEXT MONTH

Once you've typed in the program you'll be all set for future columns. Next month we're going to start exploring that useful area of memory called the Kernal. In the meantime have fun trying out your new program.

Any questions or comments should be sent to: ERIC GIGUERE c/o *COMMANDER* Magazine, P. O. Box 98827, Tacoma, WA 98498. Please allow several weeks for a reply, as they must be relayed to me in Canada

Explorations With Assembly Language

DIS/MON

```
10 REM     ***********
20 REM     *         *
30 REM     * DIS/MON *
40 REM     *         *
50 REM     ***********
60 REM
70 REM COPYRIGHT (C)1983 BY
80 REM     ERIC GIGUERE
90 REM
100 IF PEEK(806)=202 THEN POKE
    53280,6: POKE 53281,1: GOTO
     120
110 POKE 36879,30
115 REM VIC OWNERS WILL HAVE TO
     ADJUST THE FOLLOWING PRINT
     STATEMENTS TO FIT
117 REM THE 22-COLUMN SCREEN. N
    O BIG DEAL.
120 PRINT''[clr][rvs-on][grn][s
    p, 40 times]'';
130 PRINT''[rvs-on][sp, 17 time
    s]DIS/MON[sp, 16 times]'';
140 PRINT''[rvs-on][sp, 40 time
    s]''
150 PRINT''[down][blu][sp, 3 ti
    mes]COPYRIGHT[sp](C)1983[sp
    ]BY[sp]ERIC[sp]GIGUERE''
160 PRINT''[down, 10 times]'':
    OPEN 4,3
165 :
170 CS$=''ACDGLMPRSX:Z'':HN$=''
    0123456789ABCDEF'':NU$=CHR$
    (0):QU$=CHR$(34)
180 R$=CHR$(13)
190 LM=PEEK(44)*256+PEEK(43)-2:
     HM=PEEK(46)*256+PEEK(45)+1
200 PRINT ''[down][blu]]'';: GO
    SUB 8000: COM$=LEFT$(A$,1)
210 Z=0:FORY=1TO12:IFCOM$=MID$(
    CS$,Y,1)THENZ=Y:Y=1E9
230 NEXT:IFZ=0THENPRINT''[down]
    [grn]COMMANDS:[sp]A,C,D,G,
    L,M,P,R,S,X,:[sp]OR[sp]Z'';
    GOTO200
240 ON Z GOTO 500,1000,1500,200
    0,2500,3000,3500,4000,4500,
    5000,5500,6000
497 REM
498 REM (A)SCII
499 REM
500 IF A>65535 THEN 7000
510 IF B<A OR B>65535 THEN 7010
520 ZZ=-1: FOR LOOP=A TO B: ZZ=
    ZZ+1
530 IFZZ/16=INT(ZZ/16)THEN DV=L
    O:M=0:GOSUB 8550: PRINT#4:
    PRINT#4,HX$'':[rvs-on]'';QU
    $;
540 DV=PEEK(LOOP): PRINT#4,CHR$
    (DV);
550 WAIT 197,64: GET KEY$: IF K
    EY$=''[sp]'' THEN LOOP=1E9
```

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Circle No. 159

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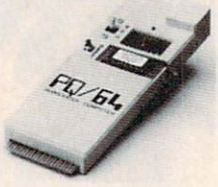
PQ/64 all features of Promqueen less mimic mode. Software enhanced to include EPROM QC utilities, RS-232 communication, printouts. 28 pin ZIF socket. Reads, edits runs and programs all 5 volt 2500 and 2700 series EPROMS plus variety of EEPROMS all without personality modules. Commodore C-64 host computer.



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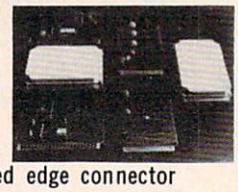

VIC-20 versions include model V-8 for two 2732 EPROMS and model V-16 for 4 2732 EPROMS. C-64 versions include model C-16 for four 2732 EPROMS and model B-16 for two 2764 EPROMS.

All products shipped with comprehensive documentation. Call our user hotline **617-283-7719** or write for information: Gloucester Computer, 1 Blackburn Center, Gloucester, MA 01930.

Circle No. 19


```
560 NEXT LOOP: PRINT#4: GOTO 20
    0

997 REM

998 REM (C)ATALOG

999 REM

1000 PRINT#4 : OPEN 15,8,15,''I''
     : GOSUB 7500: IF E THEN 760
     0

1010 OPEN 1,8,0,''$0'': GOSUB 75
     00: IF E THEN 7600

1020 GET#1,A$,A$

1030 GET#1,A$,A$

1040 IF A$=CHR$(0) THEN 1130

1050 GET#1,A$,B$

1060 PRINT#4,ASC(A$+NU$)+ASC(B$+
     NU$)*256;

1070 GET#1,A$

1080 IF A$=CHR$(0) THEN PRINT#4: GO
     TO 1030

1090 PRINT#4,A$;

1100 GET KEY$: IF KEY$=''[SP]''
     THEN 1130

1110 WAIT 197,64

1120 GOTO 1070

1130 PRINT#4: CLOSE 1: CLOSE 15:
      GOTO 200

1497 REM

1498 REM (D)ISASSEMBLE

1499 REM

1500 IF A>65535 THEN 7000

1510 IF B<A OR B>65535 THEN 7010

1520 PRINT#4: PC=A

1530 M=0: DV=PC: GOSUB 8550: PRI
     NT#4,HX$;''[SP]'';: BY=PEEK
     (PC): RESTORE
```

TWO EXCITING NEW PRODUCTS FOR THE COMMODORE-64

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The RAMDISK-64 is 64 kbytes of RAM used to emulate a disk drive. Use the RAMDISK-64 for extremely fast program loads and saves. Use it as a second disk drive. Or use the 64 kbytes as extra memory for storing spreadsheets, text pages, and graphics screens without using any of Commodore's RAM space.

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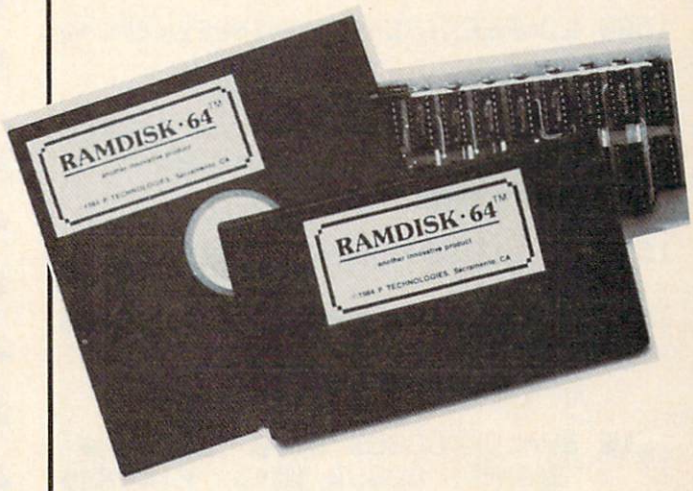

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The VIDEO-80 is a high quality cartridge that doubles your view to 80 columns. Now you can be serious about word processing and programming for an affordable price.

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```
1540 READ OP$: IF OP$=""END"" TH
     EN 1770

1550 READ VA$: IF VA$=""-1"" THE
     N 1540

1560 OP=VAL(MID$(VA$,2)): IF BY<
     >OP THEN 1550

1570 PRINT#4,OP$""[sp]"";: AD=VA
     L(LEFT$(VA$,1))

1580 LO=PEEK(PC+1): HI=PEEK(PC+2
     )

1585 IF LEFT$(OP$,1)<>""B"" OR O
     P$=""BIT"" OR OP$=""BRK"" T
     HEN 1610

1590 IF LO>127 THEN LO=-256+LO

1600 PC=PC+2: DV=PC+LO: M=0: GOS
     UB 8550: PRINT#4,""$"";HX$:
      GOTO 1740

1610 DV=LO: GOSUB 8540: LO$=HX$:
      DV=HI: GOSUB 8540: HI$=HX$

1620 ON AD+1 GOTO 1630,1640,1650
     ,1670,1680,1690,1700,1710,1
     720,1730

1630 PRINT#4,""#$"";LO$: PC=PC+2
     : GOTO 1740

1640 PRINT#4,""$"";LO$: PC=PC+2:
      GOTO 1740

1650 IF OP$=""LDX"" OR OP$=""STX
     "" THEN PRINT#4,""$"";LO$;""
     ,Y"": PC=PC+2: GOTO 1740

1660 PRINT#4,""$"";LO$;"",X"": P
     C=PC+2: GOTO 1740

1670 PRINT#4,""($"";LO$;"",X)"";
      PC=PC+2: GOTO 1740

1680 PRINT#4,""($"";LO$;""),Y"":
      PC=PC+2: GOTO 1740

1690 PRINT#4,""$"";HI$;LO$: PC=P
     C+3: GOTO 1740

1700 PRINT#4,""($"";HI$;LO$;"")""
     : PC=PC+3: GOTO 1740

1710 PRINT#4,""$"";HI$;LO$;"",X""
     : PC=PC+3: GOTO 1740

1720 PRINT#4,""$"";HI$;LO$;"",Y""
     : PC=PC+3: GOTO 1740

1730 PRINT#4: PC=PC+1

1740 WAIT 197,64: GET KEY$: IF K
     EY$=""[sp]"" THEN PC=1E9

1750 IF PC>B THEN PRINT#4: GOTO
     200

1760 GOTO 1530

1770 PRINT#4,""###"": PC=PC+1: G
     OTO 1740

1997 REM

1998 REM (G)OTO

1999 REM

2000 IF A>65535 THEN 7000

2010 SYS (A): GOTO 200

2497 REM

2498 REM (L)OAD

2499 REM

2500 GOSUB 7700: IF E THEN PRINT
      ""[down][red]NO[sp]FILENAM
     E"": GOTO 200

2510 P=512: FOR ZZ=1 TO LEN(N$):
      ZY=ASC(MID$(N$,ZZ,1)): POK
     E P,ZY: P=P+1

2520 NEXT: POKE 183,P-512: POKE
     187,0: POKE 188,2: POKE 185
     ,1: POKE 184,127

2530 POKE P,169: POKE P+1,0: POK
     E P+2,32: POKE P+3,213: POK
     E P+4,255

2540 POKE P+5,96: POKE 186,DE: P
     OKE 157,128: PRINT ""[up]""
     ;: SYS P: PRINT: GOTO 200

2997 REM

2998 REM (M)EMORY

2999 REM

3000 IF A>65535 THEN 7000

3010 IF B<A OR B>65535 THEN 7010
```

```
3020 ZZ=-1: FOR LOOP=A TO B: ZZ=
     ZZ+1

3030 IF ZZ/8=INT(ZZ/8) THEN DV=L
     OOP: M=0: GOSUB 8550: PRINT
     #4: PRINT#4,HX$;:;

3040 DV=PEEK(LOOP): GOSUB 8540:
     PRINT#4,HX$;[sp];

3050 WAIT 197,64: GET KEY$: IF K
     EY$=[sp] THEN LOOP=1E9

3060 NEXT LOOP: PRINT#4: GOTO 20
     0

3497 REM

3498 REM (P)RINTER ON/OFF

3499 REM

3500 IF MID$(IN$,4,1)="N" THEN
      CLOSE4: OPEN 4,4: GOTO 200

3510 IF MID$(IN$,4,1)="F" THEN
      CLOSE4: OPEN 4,3: GOTO 200

3520 GOTO 200

3997 REM

3998 REM (R)EGISTER DISPLAY

3999 REM

4000 PRINT#4,R$;[sp, 2 times]AC
     [sp, 2 times]XR[sp, 2 times
     ]YR;

4010 FOR LOOP=780 TO 782: DV=PEE
     K(LOOP): GOSUB 8540: PRINT#
     4,[sp, 2 times];HX$;: NE
     XT

4020 PRINT#4,R$: GOTO 200

4497 REM

4498 REM (S)AVE MEMORY

4499 REM

4500 GOSUB 7700: IF E THEN PRINT
      [down][red]NO[sp]FILENAM
     E: GOTO 200

4510 P=512: FOR ZZ=1 TO LEN(N$):
      ZY=ASC(MID$(N$,ZZ,1)): POK
     E P,ZY: P=P+1
```


DISK UTILITIES
FOR COMMODORE COMPUTERS

*****DISK SUPPORT ($14.95 postage paid)*****

This program, written for the VIC-20 and COMMODORE 64, provides a 1K machine language extension which adds twelve new commands to your computer's operating system. Not to be confused with the cumbersome "wedge", DISK SUPPORT offers 12 separate, easy to use, two-keystroke commands which WORK! You can SAVE with *automatic* VERIFY, SAVE-WITH-REPLACE (eliminating Commodore's DOS bug), LOAD, VERIFY, DELETE, and RENAME disk files with just two keystrokes. Also provided are commands which INITIALIZE, FORMAT and VALIDATE a diskette, EXECUTE any program on the diskette, print the ERROR message to the screen, and list the diskette's directory to the screen (formatted for your computer's display) without affecting the contents of the computer's memory; all with only two keystrokes. DISK SUPPORT is a MUST for all disk drive users!

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If you have ever accidentally "SCRATCHED" a program or a data file from one of your diskettes and wished there were only some way to recover that precious file, disk retriever is the program you've been waiting for! DISK RETRIEVER is a 100% machine language program that will "UNSCRATCH" all of your disk files and restore them to their original status. Let DISK RETRIEVER turn back the clock and help you recover your "lost" programs and files!

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Circle No. 245

Circle No. 102

MicroBase written by aliens

ARFON DENIES UFO INVOLVEMENT

Lafayette,LA--Officials at Arfon Microelectronics today denied connections between their program MicroBase and recently reported UFO landings in the surrounding Atchafalaya Basin. In a daring midnight raid, Lafayette police apprehended Patrick Doyle, vice-president of the company, and several co-workers, as they tried vainly to escape in their pirogue. The police report alleges that the suspects were seen accepting computer programs, thought to be MicroBase, from a reportedly alien vehicle. Doyle released the following statement on Monday morning:

"I would like to reply to the allegations that our program MicroBase was written by aliens. I will concede that MicroBase is out of this world, with its speed, simplicity, and versatility, but it most certainly is not the product of little green men.

"For the record, let me state that MicroBase was written by a human being like you or me, who was concerned about the lack of quality personal data bases for the VIC 20 and Commodore 64. So he came up with MicroBase, the first data base to run interchangeably on the VIC and 64. MicroBase has all the features of the bigger data bases: user-configurability, sort capability, and seven different search parameters. It allows up to 12 fields per record, up to 80 characters per field, and up to 196 characters per record. And it's memory-resident, so it's faster than disk or tape-resident data bases.

"We can only speculate that the UFO rumors were started because of MicroBase's unearthly price--only $29.95 for tape and $34.95 for disk."

When asked just what he and the Arfon staff were doing in the middle of a swamp at midnight with a Commodore 64 and an undisclosed number of MicroBase programs, Doyle replied, "Cataloging the alligators, of course."

For more information about Microbase and other Arfon products, call (318) 988-2489 or write Arfon Micro, 300 Teurlings Drive, Lafayette, LA 70509. Dealer inquiries welcome.

```
4520 NEXT: POKE 183,P-512: POKE
     187,0: POKE 188,2: POKE 185
     ,0: POKE 184,127

4530 POKE 186,DE: POKE 157,128:
     A%=A/256: POKE 194,A%

4540 POKE 193,A-A%*256: POKE P,1
     69: POKE P+1,193: POKE P+2,
     162

4550 POKE P+4,160: POKE P+6,32:
     POKE P+7,216: POKE P+8,255:
      POKE P+9,96

4560 B%=B/256: POKE P+3,B-B%*256

4570 POKE P+5,B%: PRINT''[uP]'';
     : SYS P: PRINT: GOTO 200

4997 REM

4998 REM E(X)IT COMMAND

4999 REM

5000 PRINT''[down][blk]TO[sP]RE-
     ENTER[sP]PROGRAM[sP]TYPE[sP
     ]'GOTO[sP]200'.'':END

5497 REM

5498 REM (:) MEMORY CHANGE COMMA
     ND

5499 REM

5500 IF LEN(IN$)<8 THEN PRINT ''
     [down][red]NO[sP]DATA'':GOT
     O200

5510 V$=MID$(IN$,2,4): GOSUB 850
     0: IF DV<HM AND DV>LM THEN
     200

5520 P=DV: FOR ZZ=7 TO LEN(IN$)
     STEP 3: V$=MID$(IN$,ZZ,2):
     GOSUB 8500

5530 POKE P,DV: P=P+1: NEXT: GOT
     O 200

5997 REM

5998 REM (Z) SEND DISK COMMAND

5999 REM

6000 GOSUB 7700: IF E THEN PRINT
      ''[down][red]NO[sP]COMMAND
     [sP]TO[sP]BE[sP]SENT'': GOT
     O 200

6010 OPEN 15,8,15: IF LEFT$(N$,1
     )=''E'' THEN PRINT: GOSUB 7
     500: GOTO 7600

6020 PRINT#15, N$; CLOSE 15: GOT
     O 200

7000 PRINT ''[down][grn]FIRST[sP
     ]VALUE[sP]OUT[sP]OF[sP]RANG
     E'': GOTO 200

7010 PRINT ''[down][grn]SECOND[s
     P]VALUE[sP]OUT[sP]OF[sP]RAN
     GE'': GOTO 200

7497 REM

7498 REM GET DISK STATUS

7499 REM

7500 INPUT#15,E,E$,T,S: IF E<20
     THEN E=0

7510 RETURN

7597 REM
7598 REM PRINT DISK ERROR MESSAG
     E

7599 REM

7600 PRINT ''[blk]DISK[sP]ERROR:
     [down][red]''

7610 PRINT E;''-[sP]'';E$;'':'';
     T;'','';S

7620 CLOSE 1: CLOSE 15: GOTO 200

7697 REM

7698 REM GET FILENAME & DEVICE

7699 REM

7700 E=0: N$='''': QU=0: FOR LOO
     P=1 TO LEN(IN$): ZZ$=MID$(I
     N$,LOOP,1)

7710 IF ZZ$=CHR$(39) THEN QU=1-Q
     U: IF QU=0 THEN EN=LOOP: LO
     OP=1E9: GOTO 7730
```

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Circle No. 34

```
7720 IF QU THEN N$=N$+ZZ$

7730 NEXT LOOP: N$=MID$(N$,2): I
     F LEN(N$)<1 THEN E=1

7740 DE$=MID$(IN$,EN+2): ZZ=VAL(
     DE$): IF ZZ<8 AND ZZ<>1 THE
     N ZZ=8

7750 DE=ZZ: FOR LOOP=1 TO LEN(DE
     $)

7760 IF MID$(DE$,LOOP,1)="","" T
     HEN IN$=""[sp, 2 times]""+M
     ID$(DE$,LOOP+1): LOOP=1E9

7770 NEXT LOOP: GOSUB 8100: RETU
     RN

7997 REM

7998 REM GENERAL PURPOSE INPUT R
     OUTINE

7999 REM

8000 IN$="""":PRINT""[sp][left]""


8010 P=PEEK(209)+PEEK(210)*256+P
     OS(0):CH=PEEK(P):RC=128:TT=
     0

8020 POKEP,CH+RC:TT=TT+1:IFTT>10
     THENTT=0:RC=128-RC:GOTO8020

8030 GETX$:IFX$=""""THEN8020

8040 X=LEN(IN$):IFX$=CHR$(34)THE
     NX$=CHR$(39):GOTO8080

8050 IFX$=CHR$(20)ANDX>0THENIN$=
     LEFT$(IN$,X-1):POKEP,CH:PRI
     NT""[left][sp][left]"";:GOT
     O8010

8060 IFX$=CHR$(13)ANDX>0THENPOKE
     P,CH:PRINT:GOTO8090

8070 IFASC(X$)<32ORASC(X$)>90THE
     N8020

8080 IN$=IN$+X$:POKEP,CH:PRINTX$
     ""[sp][left]"";:GOTO8010

8090 A$=LEFT$(IN$,1)

8100 V$=MID$(IN$,3,4): GOSUB 850
     0: A=DV: V$=MID$(IN$,8,4):
     GOSUB 8500: B=DV

8110 RETURN

8497 REM

8498 REM HEX TO DECIMAL

8499 REM

8500 DV=0: FOR HX=1 TO LEN(V$):
     DV%=ASC(V$+NU$): DV%=DV%-48
     +(DV%>64)*7

8510 V$=MID$(V$,2): DV=16*DV+DV%
     : NEXT: IF DV<0 THEN DV=0

8520 RETURN

8524 REM

8525 REM DECIMAL TO HEX

8526 REM

8530 DV=VAL(V$): REM ENTRY POINT
      1

8540 M=0: IF DV<256 THEN M=2: RE
     M ENTRY POINT 2

8550 IF DV<0 THEN DV=0: REM ENTR
     Y POINT 3

8560 N=DV: N%(1)=N/4096: N=N-N%(
     1)*4096: N%(2)=N/256: N=N-N
     %(2)*256: N%(3)=N/16

8570 N%(4)=N-N%(3)*16:HX$="""":
     FOR HX=1+M TO 4: HX$=HX$+MI
     D$(HN$,N%(HX)+1,1)

8580 NEXT: RETURN

8999 END

9000 DATA ADC,0105,1101,2117,397
     ,4113,5109,7125,8121,-1

9010 DATA AND,041,137,253,333,44
     9,545,761,857,-1

9020 DATA ASL,16,910,514,222,730
     ,-1

9030 DATA BCC,9144,-1

9040 DATA BCS,9176,-1

9050 DATA BEQ,9240,-1

9060 DATA BIT,136,544,-1
```

```
9070 DATA BMI,948,-1
9080 DATA BNE,9208,-1
9090 DATA BPL,916,-1
9100 DATA BRK,90,-1
9110 DATA BVC,980,-1
9120 DATA BVS,9112,-1
9130 DATA CLC,924,-1
9140 DATA CLD,9216,-1
9150 DATA CLI,988,-1
9160 DATA CLV,9184,-1
9170 DATA CMP,3193,1197,0201,520
     5,4209,2213,8217,7221,-1
9180 DATA CPX,0224,1228,5236,-1
9190 DATA CPY,0192,1196,5204,-1
9200 DATA DEC,1198,5206,2214,722
     2,-1
9210 DATA DEX,9202,-1
9220 DATA DEY,9136,-1
9230 DATA EOR,365,169,073,577,48
     1,285,889,793,-1
9240 DATA INC,1230,5238,2246,725
     4,-1
9250 DATA INX,9232,-1
9260 DATA INY,9200,-1
9270 DATA JMP,576,6108,-1
9280 DATA JSR,532,-1
9290 DATA LDA,3161,1165,0169,517
     3,4177,2181,8185,7189,-1
9300 DATA LDX,0162,1166,5174,218
     2,8190,-1
9310 DATA LDY,0160,1164,5172,218
     0,7188,-1
9320 DATA LSR,170,974,578,286,79
     4,-1
9330 DATA NOP,9234,-1
```


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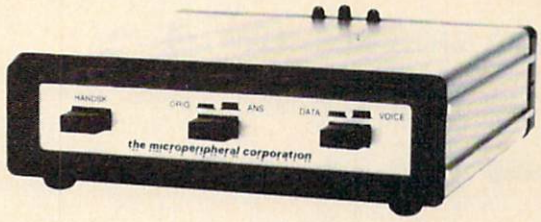

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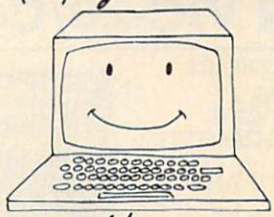

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```
9340 DATA ORA,31,15,09,513,417,2
     21,825,729,-1

9350 DATA PHA,972,-1

9360 DATA PHP,98,-1

9370 DATA PLA,9104,-1

9380 DATA PLP,940,-1

9390 DATA ROL,138,942,546,254,76
     2,-1

9400 DATA ROR,1102,9106,5110,211
     8,7126,-1

9410 DATA RTI,964,-1

9420 DATA RTS,996,-1

9430 DATA SBC,3225,1229,0233,523
     7,4241,2245,8249,7253,-1

9440 DATA SEC,956,-1

9450 DATA SED,9248,-1

9460 DATA SEI,9120,-1

9470 DATA STA,3129,1133,5141,414
     5,2149,8153,7157,-1

9480 DATA STX,1134,5142,2150,-1

9490 DATA STY,1132,5140,2148,-1

9500 DATA TAX,9170,-1

9510 DATA TAY,9168,-1

9520 DATA TSX,9186,-1

9530 DATA TXA,9138,-1

9540 DATA TXS,9154,-1

9550 DATA TYA,9152,-1

9990 DATA END

9995 :

9996 :

9997 :

9998 *** END OF PROGRAM ***
```


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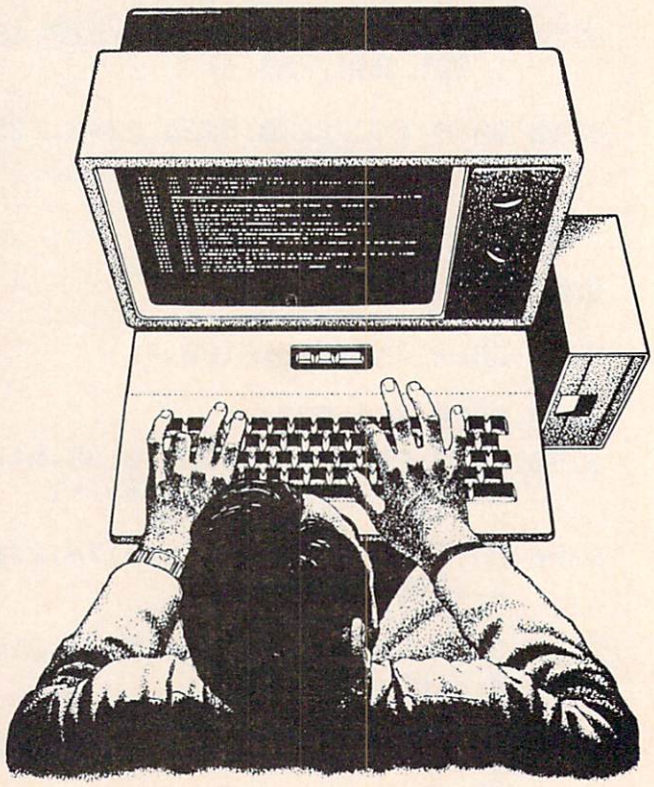

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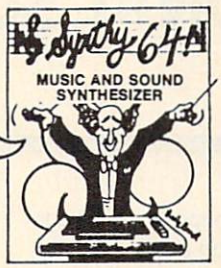

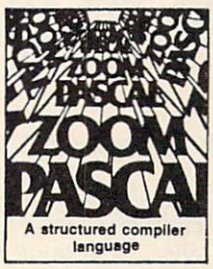

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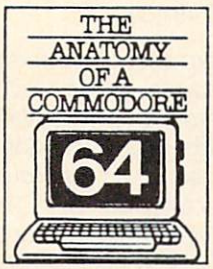

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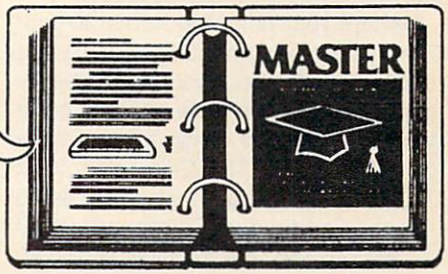

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Circle No. 69

Electronic Blackboard
REVIEWS of EDUCATIONAL SOFTWARE

By Maryanne Dodd

Ah, Spring is here. Everyone's fancy is turning to something–and I would be willing to bet that no one's fancy is turning to math. Still, there are a couple of months of school left; and for those who need a tutorial to help them grasp math procedural concepts, the CBS SUCCESS WITH MATH Series might just be the software package that will help wrap up a successful school year. There are four different programs that cover basic math operations and algebraic equations.

Perhaps your fancy has turned to your Commodore 64 computer, and you want to know more about your new love, or you want to to introduce a friend to the wonderful world of computerese. Take a look at the I AM THE C-64 Series from CREATIVE SOFTWARE. This two disk series uses the Commodore 64 computer itself to answer the old familiar question, "What can a computer do?" and teach fundamental concepts.

Enough talk about fancy, April is also famous for its showers. So for all of the armchair athletes or others caught inside on a rainy day, WORDRACE from DON'T ASK COMPUTER SOFTWARE could come to the rescue and give your vocabulary abilities a real workout.

By now all readers are probably wondering where my fancy has departed. It's still here, but before you depart let's take a more serious look at this month's reviews.

TITLE: ***I AM THE C-64***
INTRODUCTORY SERIES: Volumes 1, 2, & 3
ADVANCED SERIES: VOLUMES 4, 5, & 6

FORMAT: Diskette.
PRICE: $29.95 for the set of two diskettes.
MODEL: Commodore 64.
AUDIENCE: Intermediate school age through adult.
SUMMARY: A tutorial survey of the Commodore 64 featuring the capabilities of the Commodore 64 and an introduction to programming using Basic Language.
SOURCE: CREATIVE SOFTWARE
230 East Caribbean Drive
Sunnyvale, CA 94089
(408) 745-1644

If you want to learn about something, go directly to the source. This is exactly what the Paholkes from CREATIVE SOFTWARE did. To teach about the Commodore 64, what better source could there be than the computer itself. The Paholkes–in a cleverly-designed, two-diskette, six-volume set–programmed the computer to teach about itself.

WHAT CAN THE COMPUTER DO?

In Volume 1, after a frolicking stanza of "I'm a Yankee Doodle Dandy" and a short introduction, the computer demonstrates some of the many things it can do. In fact it boasts and even brags a bit about its sophistication. Particular attention is given to the graphic and music capabilities with definitions and colorful examples of sprites, waveforms and voices.

KEYBOARD INTRODUCTION

Now that the C-64 has captured your attention and taken away any shyness, Volume 2 presents an introduction to the keyboard and demonstrates the usage of the cursor, color keys, Commodore key, run/stop, and other keys not normally found on a typewriter keyboard. Familiarity is obtained by trying the various "special keys" at appropriate places in the program and observing the results. If an inappropriate response is entered, a very soft beep is heard and the C-64 patiently awaits the correct response before it proceeds. At any time, the "F1" key is programmed to reverse the program and allow review of previous screens.

WELCOME TO CAMP BASIC

Being a proud graduate of Volume 2, you are new ready to begin some BASIC programming or "talking to the computer" in Volume 3. So welcome to "Camp Basic". An eager camp counselor sounds reveille with his bugle and will serve as your guide througout the rest of the volumes. The counselor will help you learn to give the computer instructions and make it your servant. Some of the concepts introduced in Volume 3 are: PRINT statements, variables, IF-THEN statements, GOTO and line numbering. For each concept the computer asks the user to interact by inputting from the keyboard and then observing the results. The volume closes by encouraging the new programmer to experiment using his newly found knowledge, and leaves one with the assurance that the computer cannot be hurt or damaged by typing or touching keys.

MORE BASIC

The second diskette in the series contains Volumes 4, 5 and 6. After opening with some very lively carousel music, Volume 4 takes us back to Camp Basic with our trusty counselor guide leading in demonstrations of some advanced BASIC commands such as GET, INPUT and GOSUB. Playing some simple games bring about an awareness of integer functions, ASCII Code, and memory addresses.

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SPRITE DESIGN

Volume 5 demonstrates sprites by drawing a rose on a grid and showing the data used. Motion is introduced and demonstrated by increasing or decreasing the position registers. Also included are helicopter crashes (collision of sprites), and a big fish swallowing a little fish (sprites moving in front of each other). The lesson closes with a number of pointers telling exactly how to go about designing a sprite and a short listing for a sprite.

SID INTRODUCTION

The last volume of the series focuses on Commodore 64 sound. We learn how to turn on the "SID" Chip. The lesson uses the analogy of comparing the computer sound to a radio. For example, a radio has to be turned on and tuned. Commodore 64 voices must also be turned on, and their frequencies are given along with instruction on how to POKE them. Waveforms are introduced along with attack/delay and sustain/release. After each concept is introduced, the student has the opportunity to input different values and observe the effects of upper and lower registers and parameters. At the end of Volume 6 a pep talk is given and the student is admonished that "the computer can do nothing without you."

EDUCATIONAL VALUE

The color, sound and graphics employed in I AM THE C-64 are *SUPERB!!* especially outstanding is the music used throughout the programs. The Paholkes really did a good job of choosing their examples and then creating exciting, interactive displays to demonstrate them.

I consider the series to be a real bargain for computer novices in the classroom or the home. The series could be used along with a manual for serious instruction, or used by itself to gain an appreciation of the capabilities of the Commodore 64. Because of its user friendliness, the series makes an ideal demonstration tool. In fact, one classroom media specialist saw me demonstrating the software, and became so enthused that she plans to use it to introduce parent volunteers to the computer. Most children in the classroom are very comfortable with a new computer, but many parents are scared to touch it.

Now that I finished all six volumes I have one question for CREATIVE SOFTWARE. Who are the Paholkes?

TITLE: WORDRACE

MODEL: Commodore 64
FORMAT: Diskette
PRICE: $29.95
AUDIENCE: Ages nine through adult
SUMMARY: Multiplayer game designed to increase the players' vocabularies.
SOURCE: DON'T ASK COMPUTER SOFTWARE
2265 Westwood Blvd.,
Suite B-150,
Los Angeles, California
90064. (213) 447-4514.

Wordrace from DON'T ASK COMPUTER SOFTWARE is a challenging vocabulary game that has been recently translated for the Commodore 64.

LEVELS OF DIFFICULTY

There are four difficulty levels of play. Beginner's WORDRACE is designed for the approximate ages of nine to fourteen. Intermediate WORDRACE is suitable for high school students and beyond. Regular WORDRACE was developed for those that had mastered the intermediate level and have extensive vocabularies at the college level. Then, to go even further, Challenge WORDRACE was devised. The challenge level contains the type of words that require the same analytic thought patterns acquired by crossword puzzle fans. Needless to say even the most verbose of us will have to consult our mental lexicons when attempting Challenge WORDRACE.

THE RACE IS ON

After choosing the desired level of play and the number of words to be played (from 1 to 1000), each player enters a name on the scoreboard and is assigned a numerical turn. A word appears on the screen, under which are six definitions. The object of the game is to pick the correct definition in the shortest amount of time. A counter is set at 600, and the computer clock starts ticking off points when the word appears. For each correct response you are awarded the number of points remaining on the clock. An incorrect response and the number of points remaining on the clock are deducted from your score. A player has the option of entering choices as long as the clock is ticking. If the player does not know the word, or chooses not to guess, no points are added or subtracted from his score. The correct answer is highlighted when the clock stops ticking. The winner is the player with the highest score at the end of the game.

BONUS GAMES

Also included on the diskette are two additional games–CLAIM TO FAME and SPORTS DERBY. These games are played in the same fashion as WORDRACE, except that instead of a word at the top of the screen there is a name and along with six identifying characteristics or reasons that the person is famous. There are 1,200 names among all of the games, so even the most astute historical buff and sports trivia fan should find at least a couple that will make them think.

Although WORDRACE does not contain graphics, I do not feel that graphics would have added significantly to the quality of the program. The only sounds are a chiming sound for correct responses and a buzzing sound for wrong guesses.

EDUCATIONAL VALUE

WORDRACE is a quality vocabulary program. The expanse of 2,500 words over four difficulty levels is impressive. Players at the beginner's level will not only increase their vocabulary but they may even increase their reading speed. The program could be used in the classroom by a wide range of students. It is not often one finds a single piece of software that can be used for both remedial work as well as an enrichment program for the advanced students. WORDRACE would also be suitable for home use as a wordgame and vocabulary stretcher.

TITLE: SUCCESS WITH MATH SERIES

AUDIENCE: ADDITION AND SUBTRACTION–Grade Levels 1-4
MULTIPLICATION AND DIVISION–Grade Levels 2-8
LINEAR EQUATIONS–Grade Levels 7-11
QUADRATIC EQUATIONS–Grade Levels 9-12
FORMAT/PRICE:
Diskette–$24.95
Cassette–$19.95
MODEL: Commodore 64
SUMMARY: CAI tutorials featuring step by step problem solving procedures and drill.
SOURCE: CBS SOFTWARE
One Fawcett Place
Greenwich, CT 06836
(203) 622-2500

The SUCCESS WITH MATH series is a set of Computer Assisted Instruction (CAI) tutorials designed for basic skill reinforcement and remedial learning. The series was developed by Don Ross, a former math teacher and founder of MICRO-COMPUTER WORKSHOPS, an educational software development company.

Each program features step-by-step problem solving techniques with immediate error identification feedback. Errors are highlighted as they occur. The student is then given a second chance to enter the correct response. After two incorrect responses the computer gives the correct answer and the student must enter the

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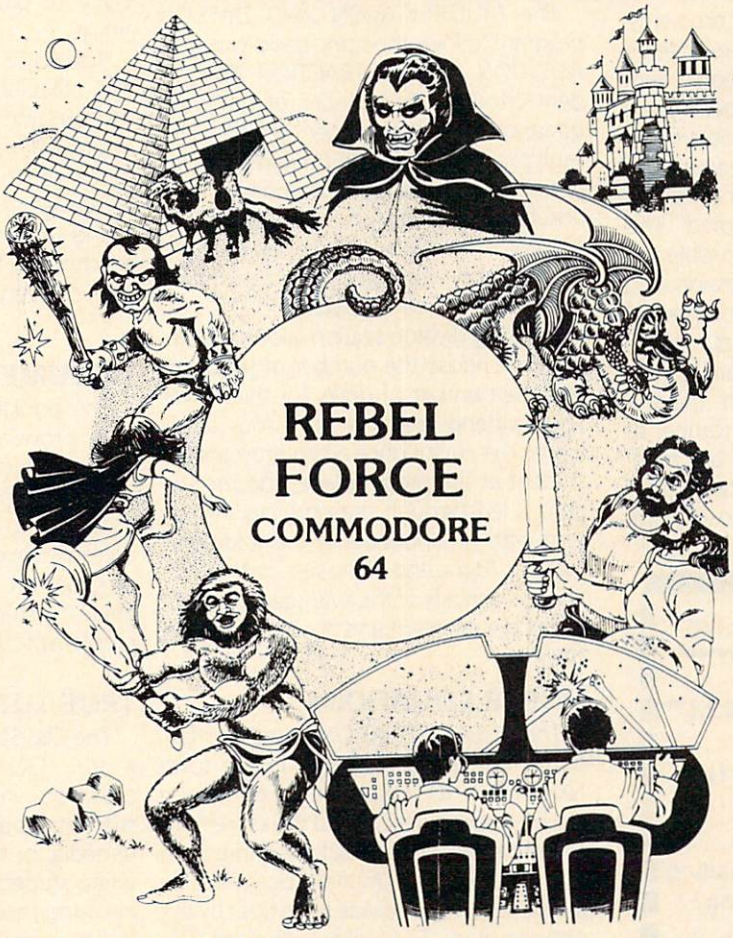

YOU ARE THE ONLY ONE LEFT TO HELP - PLEASE SAVE US

Here is the most extensive hi-res adventure game ever developed and created for the Commordore 64. It encompasses both sides of the disk and includes full color hi-res pictures. The story begins in the Kingdom of Acritym.

For numerous years the kingdom of Acritym has been ruled by Lord Cybal. A rebel group has formed in an attempt to overthrow his majesty's Acritym's government. The rebellion has left the majority of Acritym's people exhausted, famished and defenseless. Despite the small size of the group, they have a major advantage. They are very well organized. Because of this they have developed a sturdy network of guerrilla tactics that have diminished the kings army. If the rebellion and the orgaization can be thwarted the rebel force will be eliminated. His majesty is presently in hiding. YOUR MISSION - You have been hired as a mercenary of your land. You must locate the rebel meeting place. The journey will be long and hard. Others before you have fought valiantly, as you shall, only to meet their death inside the walls of Acritym.

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correction before proceeding with the remainder of the problem. An error analysis is given after each problem and also at the end of each session.

ADDITION AND SUBTRACTION

After loading ADDITION AND SUBTRACTION the student is given the choice of the type of practice operation desired, and whether or not to see instructions. If the choice is addition, the student must then decide the number of addends (rows), the number of digits in each row (columns) and the number of problems. Responses for each problem are entered from right to left, just as if the student were doing the problem on paper. If there is more than one digit in the problem, the cursor is placed at the top of the next column and the student must enter either "0" or the number that was "carried". This procedure continues until the problem is completed. At the end of the session is an error analysis, stating the total number of "carry" and computational errors, and the percentage of errors per problem.

In subtraction, as in addition, the student is allowed to choose the number of problems for each session and the number of digits in each problem. The student is also given the option of choosing problems with or without regrouping (borrowing). If regrouping is chosen, the student must decide when "borrowing" is appropriate and enter "B" from the keyboard. Then with the help of the cursor the student regroups and enters responses in the traditional right-to-left manner. The error analysis at the end of the session consists of the total number of errors and the percentage of errors per problem.

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MULTIPLICATION AND DIVISION

The MULTIPLICATION AND DIVISION program follows the same basic format as ADDITION AND SUBTRACTION. The student chooses the number of randomly generated problems per session. For multiplication there are three-digit multiplicands, and the student chooses from one to three digits for the multiplier. The student is then led through the problem step by step, with the cursor highlighting the position of each response.

The long division section allows the student to choose the number of problems and the number of digits for the divisor. The dividend contains from four to six digits. The cursor once again prompts the student at the proper place, and the student is led through the problem step by step with no shortcuts in the traditional manner. At the end of the session the error analysis consists of the average number of errors per problem and the total number of errors.

LINEAR EQUATIONS

The LINEAR EQUATIONS program randomly generates problems in the form "AX + B = C". Displayed on the screen are five procedures: (1) add the same term to both sides; (2) subtract the same term from both sides; (3) multiply both sides by the same term; (4) divide both sides by the same term; or (5) simplify both sides. The student chooses one of the procedures and then performs the arithmetic operation. At the end of each session an error analysis states the number of computational errors and the number of procedural errors involving the incorrect application of a rule.

QUADRATIC EQUATIONS

QUADRATIC EQUATIONS consists of the typical "$AX^2+BX+C=$". There are two levels of difficulty: easier, with the coefficient of the quadratic equation being one, and more difficult, with the coefficient being two or three. A menu with the following options is displayed on the screen: (1) Divide each term by the same value; (2) Factor the quadratic expression; (3) Set each factor = 0 and solve. The student is expected to pick an option and the proceed with the operation. If possible, the student is expected to factor the equation during the first step. If an incorrect response is given, an error message is printed and the student is prompted to try again. After the second incorrect response the program branches to a section that demonstrates to the student how to factor the expression. After the problems are factored, the student is expected to choose rule number three and utilize the same procedures as found in linear equations. The error analysis consists of a summary of procedural and computational errors.

The SUCCESS WITH MATH SERIES does not utilize any color, sound or graphics. The programs are all presented on a black screen with white lettering. Positive reinforcement is given in the form of messages such as: "I can see you've been doing your homework", "Too bad your teacher can't see this", "That was a good try", or "Very Impressive!".

DOCUMENTATION

The booklet accompanying each program provides good documentation. Educational objectives and program descriptions outlining the steps and procedures used along with sample problems are presented in each booklet. Preceding each program are interactive instructions that guide the student through a sample of the problems found in the program.

TRUE TUTORIAL

The CBS SUCCESS WITH MATH Series is a true CAI tutorial. After preliminary classroom introduction and instruction, students could use the series for either remedial or for practice drill. Sometimes when students are mastering operations involving multiple steps, they know how to begin and end the operation but the steps in the middle are a bit fuzzy. The SUCCESS WITH MATH Series would take these students patiently through the problems, similar to a tutor sitting down with a work sheet and monitoring each step of the problem.

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By Jim Bernard

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```
 1 PRINTCHR$(147)

 5 POKE53280,1:POKE53281,1

10 PRINTSPC(7)''[com-1][down,
   5 times]THE[sp]COMPLEAT[sp]
   BINGO[sp]CALLER''

15 PRINTSPC(19)''[down]BY'':PR
   INTSPC(14)''[down]JIM[sp]BE
   RNARD[up, 4 times]''

20 PRINT''[down, 10 times]PRES
   S[sp]THE[sp]'F-1'[sp]BUTTON
   [sp]TO[sp]START[sp]OR[sp]EN
   D[sp]A[down]BINGO[sp]GAME''

30 PRINT''[down, 4 times]PRESS
   [sp]THE[sp]'F-7'[sp]BUTTON[
   sp]TO[sp]CALL[sp]NUMBERS''

40 IFPEEK(197)=4THENGOTO55

50 GOTO40

55 PRINT''[clr]''

60 T=T+1:PRINT''[down][com-1]B
   INGO[sp]GAME[sp]#''T

61 TT=0

62 PRINTSPC(17)''[down][com-5]
   [shf-O][com-y, 4 times][sh
   f-P]''

64 PRINTSPC(11)''[com-1]NEW[sp
   , 3 times][com-5][com-H][sp
   , 4 times][com-N][sp, 3 tim
   es][com-1]NUMBER''

66 PRINTSPC(17)''[com-5][shf-L
   ][com-P, 4 times][shf-@][up
   ]''

70 PRINT''[down, 2 times][com-
   5]--[yel]*[com-1]B[yel]*[co
   m-5]-----[yel]*[com-1]I[yel
   ]*[com-5]-----[yel]*[com-1]
   N[yel]*[com-5]-----[yel]*[
   com-1]G[yel]*[com-5]-----[y
   el]*[com-1]O[yel]*[com-5]--
   [sp][home][down, 2 times][w
   ht]''
80 A=54272

100 X=INT(RND(0)*75)+1

105 GOTO800
109 TT=TT+1:TT$=STR$(TT):TP$=MI
    D$(TT$,2,2):PRINT''[com-5]''
    TP$;TAB(3)''CALLS[wht][up]''

110 IFX<16THENPOKE1242,2:GOTO12
    0

112 IFX<31THENPOKE1242,9:GOTO12
    0
```

```
114 IFX<46THENPOKE1242,14:GOTO1
    20

116 IFX<61THENPOKE1242,7:GOTO12
    0

118 POKE1242,15

120 POKE1242+A,12

130 IFX<10THENPOKE1244,32:POKE1
    245,X+48:GOTO140

132 X$=STR$(X):Y=VAL(MID$(X$,2,
    1)):Z=VAL(MID$(X$,3,1))

134 POKE1244,Y+48:POKE1245,Z+48

140 POKE1244+A,12:POKE1245+A,12

150 IFX<16THENGOSUB300

155 IFX>15ANDX<31THENGOSUB400

160 IFX>30ANDX<46THENGOSUB500

165 IFX>45ANDX<61THENGOSUB600

170 IFX>60THENGOSUB700

290 FORQ=1TO1500:NEXT

291 IFTT=75THENGOTO294

292 IFPEEK(197)=3THENGOTO100

294 IFPEEK(197)=4THENGOTO900

299 GOTO291

300 REM ''POKE[sP]IN[sP]'B'[sP]
    NUMBERS[sP]TO[sP]KEEP''

310 IFX<10THENC=1387:POKEC+(X*4
    0),X+48:POKEC+(X*40)+A,8

320 IFX>9THENB=1386:POKEB+(X*40
    ),Y+48:POKEB+(X*40)+A,8

330 IFX>9THENC=1387:POKEC+(X*40
    ),Z+48:POKEC+(X*40)+A,8

350 RETURN

400 REM ''POKE[sP]'I'[sP]NUMBER
    S''

410 B=1394:POKEB+((X-15)*40),Y+
    48:POKEB+((X-15)*40)+A,8
```


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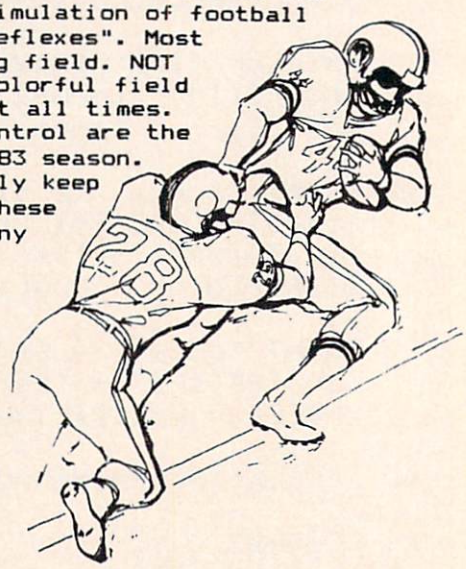

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```
420 C=1395:POKEC+((X-15)*40),Z+
    48:POKEC+((X-15)*40)+A,8

430 RETURN

500 REM ''POKE'N'[sp]NUMBERS''

510 B=1402:POKEB+((X-30)*40),Y+
    48:POKEB+((X-30)*40)+A,8

520 C=1403:POKEC+((X-30)*40),Z+
    48:POKEC+((X-30)*40)+A,8

530 RETURN

600 REM ''POKE[sp]'G'[sp]NUMBER
    S''

610 B=1410:POKEB+((X-45)*40),Y+
    48:POKEB+((X-45)*40)+A,8

620 C=1411:POKEC+((X-45)*40),Z+
    48:POKEC+((X-45)*40)+A,8

630 RETURN

700 REM ''POKE[sp]'O'[sp]NUMBER
    S

710 B=1418:POKEB+((X-60)*40),Y+
    48:POKEB+((X-60)*40)+A,8

720 C=1419:POKEC+((X-60)*40),Z+
    48:POKEC+((X-60)*40)+A,8

730 RETURN

800 REM ''AVOIDING[sp]REPEAT[sp
    ]NUMBERS''

810 U=1027

815 IFPEEK(U+X)=96THENGOTO100

820 POKEU+X,96:GOTO109

900 PRINT''[clr][com-1]'':PRINT
    SPC(14)''[down, 10 times]IN
    TERMISSION''

901 PRINT''[down, 5 times]PRESS
    [sp]THE[sp]'F-1'[sp]BUTTON[
    sp]TO[sp]BEGIN[sp]NEW[sp]GA
    ME'':FORQ=1TO1000:NEXT

902 IFPEEK(197)=4THENGOTO55

904 GOTO902
```


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Along the Adventure Game Trail

By Fred Dart

What is an ADVENTURE game? It is actually a test of your reasoning power versus that of the programmer who wrote the game. However, a good adventure is far more because it can become all-consuming and completely entrancing. Adventures capture your imagination. You don't spend your time shooting foreign objects, alien creatures or enemy vessels; you wander aimlessly in a forest, stroll through a castle, or explore the rooms in a mansion.

The object of an adventure game can be as simple as finding some TREASURES and taking them to a certain location, or as complicated as removing a CURSE so COUNT CRISTO can be freed. Now a good adventure game requires that you are able to do a certain "standard" actions, such as GET objects, take INVENTORY of what you are carrying, DROP objects, or put them down in some way. You must be able to move about, usually in different directions, such as GO NORTH; however, that varies quite a lot from game to game. Many require a one-letter command for direction, such as N for NORTH, while others would have you type in GO DEN to go from the kitchen to the DEN. They all have in common the movement from one location to another.

With many, if not most, movement is dependent on your having certain items in your possession, or else performing certain deeds before the "passage" is open to you. An example might be "WAVE WAND" before a door would open.

Most adventure games require that you map out your route as you travel from one area to another. With many games, if you do not draw a map you can't solve the puzzle–as it is necessary to retrace your route many times to accomplish the final goal. With a few games you need a very detailed map so as to avoid pitfalls along the way. One route may lead to a "chasm" into which you fall and "die" if you go too far. Each room contains different items such as a hammer that you may not see a need for immediately. It is a good idea to keep track of each object's location so that you can go back and get it later if necessary.

THE DEFINITIVE ADVENTURES

For comparison purposes, all adventure games must be compared to the works of the master. As with any other product, one usually stands out head and shoulders above the competition. The master, of course, is Scott Adams. The Scott Adams series of adventure games was the first to be released for Commodore computers. The original five involved tasks that included gathering treasures in ADVENTURELAND (what three ways do you know of to wake a sleeping dragon?), defusing a nuclear reactor in MISSION IMPOSSIBLE (and it almost is impossible), freeing Count Cristo in VOODOO CASTLE (can you get the pins out of the voodoo doll?), slaying the vampire in THE COUNT (how do you keep the vampire from stealing your stake?), and getting past the deadly black mamba snakes (maybe the mongoose can help) in PIRATE COVE.

Although Scott Adams games are hard to beat, there are others available which have some very interesting features.

MORE THAN CHEAP IMITATIONS

YOUNG ARTHUR'S QUEST is a good game that is similar in appearance to the Adams games. It includes the "SAVE GAME" feature the allows you to quit in the middle of the game and restart at a later time without losing any ground.

My recommendation to anyone who has not tried adventuring before would be to start with YOUNG ARTHUR'S QUEST before any of the Adams games, as QUEST is somewhat easier to work through. It is also recommended for younger players because a solution can be reached more easily. Some of the other games are so difficult that younger minds tire of them long before any meaningful progress is made.

A real "find" for adventurers is **GYPSUM CAVES** from Adventures, Inc. This is more than just a word game. The first part finds you in a Cave with excellent graphics. You see such things as a "rope" that is well done with custom graphics. When you "PUT ROPE" in the correct place, the graphics picture changes to show the new situation–excellent. Part one is fairly straight forward and many of the "clues" are shown on the screen instead of des-

cribed in words. In part two you are no longer in a cave but rather in a building with several rooms. Once again the visual display uses custom graphics.

Part three is different yet. It is done with all keyboard graphics and requires numbers for commands, such as 1 = north, 2 = south, etc., to get around in a maze. Eventually you will reach your "goal" and, if you have been persistent, you will know what to do when you get there.

GRAVE ROBBERS from Victory Software, is a two-part graphics game. The opening sequence shows you outside of some closed gates.

The instructions that come with the game include a large list of common verbs. As stated in the instructions "not all verbs will work in all adventures." In fact, there are usually only three or four verbs that will work in any one adventure, but sometimes you have to try them all in order to find the right ones. With "GRAVE ROBBERS", as with most adventure games, you only need to type in a verb and a noun, such as GO NORTH, or the first two letters of both words, such as OP GA for OPEN GATE.

The graphics in part one of "GRAVE ROBBERS" are quite good. You are shown a cemetery on a stormy night, with flashes of "lightning" that light up the screen. The "solution" to part one is believeable, though just slightly far fetched.

Part two is a continuation of the "search", though you have entered a "building" of some sort. The graphics again good, but the end seems rather anti-climactic. On the whole, though, I rather enjoyed GRAVE ROBBERS.

ESCAPE FROM MT. DRASH is an adventure of a different sort. To the purist it is not really an adventure game but rather a MAZE game. To the uninitiated it might pass as a sort of adventure.

You must use your imagination to assume that you are a prisoner atop MT. DRASH. The "mountain" is divided into 15 levels and you have to work your way out. You are provided with "magic" spells to help you on your way. The only problem with the "magic" spells is that they may or may not work.

The one spell that works all the time is the "sleep" spell, which puts your opponent to sleep for three turns. The other two spells are "blast" and "teleport."

The "action" begins by showing "you" in an empty mine shaft with only a few features visible. There are indications of "opponents" and an indication of the "exit" that you have to get to. By using the CURSOR keys you determine the direction of motion. If your path crosses that of one of your opponents and you find that you cannot avoid a fight, the screen changes to show a graphic depiction of you and a "monster" at the bottom of the screen, where a duel ensues. You have three moves, READY, THRUST and COUNTER THRUST.

All in all, this game does have some pretty good graphics and is a passable MAZE game. Yet, it doesn't meet many of our requirements for a true adventure game in that you don't really go from place to place but rather simply follow a maze, and you can't GET anything. Although there are "Jewels" on different levels, all you have to do is go to the same space as the Jewels and you "have" them. Also, you cannot take INVENTORY. ESCAPE FROM MT. DRASH is pleasing as a strictly maze game, but cannot be fully recommended to adventure game purists.

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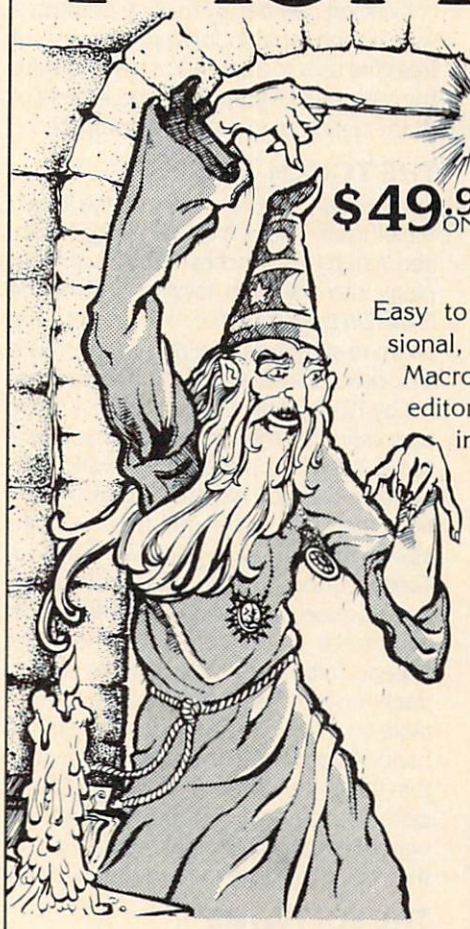

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The Koala Pad Touch Tablet: How to Bear With it Part I: OVERVIEW

By Ian Adam

TITLE:	***KoalaPad Touch Tablet***
FORMAT:	Digitizer tablet and disk.
PRICE:	$100 to $150
LANGUAGE:	Internal; menu-driven.
MODEL:	Model for the Commodore 64 with Disk Drive is reviewed; also available for the VIC-20 and other computers.
AUDIENCE:	Anyone who enjoys drawing and can press a button; ages 4 to 99.
SUMMARY:	High-Resolution drawing aid tablet and program.
SOURCE:	Koala Technologies Corporation 3100 Patrick Henry Drive, Santa Clara, California 95050 (408) 986-8866 (widely distributed)
RATING:	Excellent.
WARRANTY:	Standard 90-day return for repair or replacement. $25 charge thereafter. A warranty card must be returned, which also entitles the owner to receive a quarterly newsletter.

The Commodore 64 has some of the finest graphics capabilities of any home computer available. However, as anyone who has tried to work with the high resolution graphics can attest, making use of those interesting facilites can be a long and tiresome process. There are no direct commands for plotting points or lines, or any other high-res graphics functions. As a result a complex series of PEEK's, POKE's, and calculations is required in order to create even the simplest of graphics displays. This requirement tends to suppress the creativity of anyone inclined to use the high-res graphics system.

The KoalaPad touch tablet solves that problem, and does so in a most useful and convincing manner. By making graphics a simple and straightforward process, it frees the user to apply his or her energy to the creation of a graphic image, instead of to the details of operating a computer.

THE TOUCH TABLET

The heart of the system is the touch tablet itself. This is a white plastic tablet, about six by eight inches (15 by 20 cm) that plugs into the front joystick port of the C-64. On the face of the touch tablet is the pressure-sensitive drawing surface; this is a black inset area, about 4¼ inches square (10 by 10 cm). Input to the device is made by pressing on the surface with the plastic stylus, which is supplied, or with your finger (which you have to supply). In addition, there are two large, black buttons above the pressure-sensitive surface. These buttons, which click reassuringly when pressed, are used to send additional commands to the computer. The tablet appears to be well-made of plastic, with a sleek rugged design. It is equally comfortable on a table, in your lap, or held in the hand. According to the Owner's Manual, the tablet can be wiped with a damp cloth, but should not be immersed in water. Sharp objects should be avoided, as they could damage the sensitive surface.

THE SOFTWARE

As attractive as the touch tablet is, it only springs to life when combined with the appropriate software. The manufacturer offers or proposes a number of programs based on the touch tablet, at extra cost. Included in the package, however, is the Poala Painter program on disk. This is all that is needed to allow the user to doodle, draw, or create various other screen images using the KoalaPad.

Koala Painter is a menu-based drawing system. Inputs to the computer, even choices from the menu, are made by pressing on the tablet. When the program is first powered up, the main menu is displayed. This offers the user a dozen choices on how to draw, as well as eight different "brushes" to draw with, a mirror option for symmetrical pictures, and two erase options. Drawing can be in any of the sixteen colors available on the C-64, or in 120 different mixed colors. Other options available are disk access, which has its own menu screen, or switching between the two high-resolution screens, which can be stored simultaneously.

Koala Painter draws in the multi-color mode. This reduces the screen resolution by half, to 200 by 160 pixels. The results are much better color, since four colors can be provided in each character cell of the screen. Also, the color distortion introduced by many TV's and monitors is reduced. The program has advanced logic for appropriating the colors and only occasionally stumbles.

While the workings of the graphics program may be quite complicated, operating it is simplicity itself–literally child's play! When you press on the touch tablet, an arrow (the cursor) appears on the computer screen. Move your finger or the stylus, and the arrow-cursor follows you around the screen. To make a selection from the menu, simply maneuver the cursor over the box containing your choice, then press either of the two buttons on the tablet. To acknowledge this choice, your selection flashes. When you have selected a brush and color, you are ready to draw; simply move the cursor

below the bottom of the menu until you hear a beep, press a button, and you are presented with a blank screen on which to create your masterpiece. Drawing works much the same as the menu–move the stylus on the surface of the tablet, and the arrow, now labelled with the drawing mode you have selected, follows you about the screen. When the position is right, press or hold either of the buttons to draw. Again, move off the bottom of the screen, press a button, and the menu reappears.

THE MENU CHOICES

To simplify use by children or the uninitiated, all commands on the main menu are accompanied by symbolic legends. Here are the choices available:

Draw: Press a button on the tablet, and an individual point is plotted. Hold a button down while you move the stylus, and continuous lines are plotted.

Line: The first time you press a button you nail down one end of an elastic band. Then, as you move the cursor about the screen, the elastic follows you. Press again, and the line is fixed in place.

Lines: Lines will be plotted end to end, each requiring only one press of a button, until you return to the menu.

Rays: Again, numerous lines will be plotted. This time, however, instead of being joined end to end, they will all radiate from one point, the first you specify.

Frame: This mode selects a rectangular frame of any size, shape and location you instruct. Pick a point anywhere on the picture, and press a button to specify a corner of the frame. Then, as you move the stylus, an elastic frame is drawn, using the fixed point and your stylus as opposite corners. When the frame is the right size and shape, press again to fix it. You can still move the now-rigid frame around the screen; press a button a third time to fix its location.

Box: This mode is identical fo Frame, but plots a solid box instead of a frame.

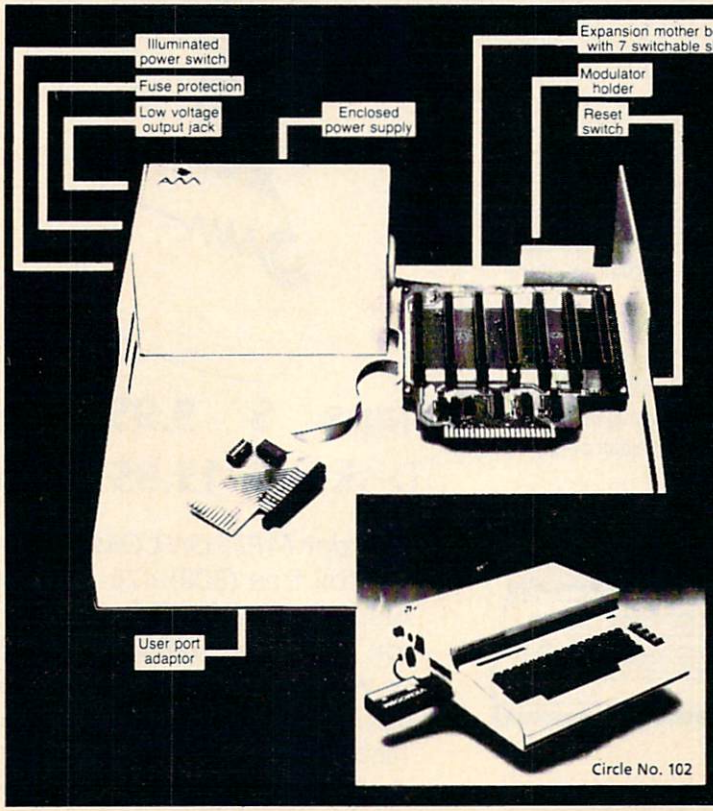
Circle: Much like Frame, this option plots a circle on the screen. The first point you select is on the circle; the second is the center, thus establishing the radius. Again, you can move the finished circle about the screen, and press a button a third time to nail it down.

Disc: Probably the most interesting function to watch, this fills an enclosed area with the current color. Starting from your specified point, a line moves up the screen until an obstacle is met, then fills first one side, then the other. Finally, the area below is filled, plus any missing corners. But beware–the program is very efficient. If there are any gaps in the enclosure, some of the color will leak out and begin filling the rest of the universe!

Xcolor: Position the arrow-cursor on any point on the screen. All points in the picture in that color will be converted to the current brush color.

Copy: Allows you to copy any part of the picture elsewhere, repeatedly if you wish. Combined with 'swap', part of the image can be copied from one high-res screen to the other.

New VIC Superchassis II



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Circle No. 102

Zoom: Absolutely great for detailed work! Zoom is on one part of the picture, which is then enlarged by a factor of four so that you can create fine details. As you make changes, you can also see them being incorporated on the main picture.

Mirror: This splits the screen into four quadrants, and mirrors all images in all four quadrants. Produces interesting geometric patterns.

Brushes: There are eight paint brushes available, including thin, thick, angled lines, and multiple points.

Colors: Select any of the 16 standard colors, or a combination of any two in a checkerboard pattern. The screen border indicates the current color.

Swap: Allows you to switch back and forth between the two high-res screens held in memory.

Erase: Be careful! Select this, and the high-res screen last accessed is wiped clean. As insurance the button must be pressed twice.

Ops: Aptly named, this function erases all changes since the last menu access. (You can also stop some functions in progress by pressing a button.)

Storage: This is the disk access, and has its own menu screen. You can use the touch tablet to select and load an existing picture, or replace it after changes. You must revert to the mean old computer keyboard to name a new picture or initialize a disk. Up to 16 pictures can be stored on each disk.

Very interesting effects can be obtained by combining these options. For example, select a three-point brush and plot a frame, and you get three frames. Use the mirror function, and you get twelve frames. Then select a combination color, and you get twelve checkerboard frames!

The disk also includes ten sample screens of information, including various scenes, animals, dragons, and even an alphabet. You can also copy information from them (such as letters from the alphabet) onto your own pictures.

POTENTIAL IMPROVEMENTS

You might get the impression by now that I like the KoalaPad, that's certainly true. However, like any good product, there could still be improvements. For example, in the zoom mode, you can only draw; the other functions such as fill, line, etc. are not available.

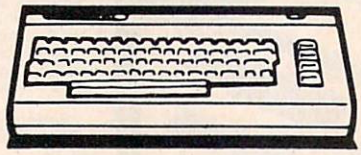
Also, only the four-quadrant mirror is available, though there are many situations where you might want a two-part mirror, reflected about a single horizontal or vertical line. The method of storing programs on disk limits the user to about an eight-character name. This is enough to identify the picture, but does not allow much latitude for a descriptive name. Finally, it would be a very nice feature to be able to print out a copy of a completed picture. Most printers, while of course not equipped for full color, are still capable of producing good-quality high-res images. There would be difficulty in adapting to the many kinds of printers and interfaces on the market, but the task is not impossible.

MULTIPLE USES

Th potential uses of the KoalaPad are numerous. First of course, it can be used to create high-res screens for other programs. It also serves an ideal introduction to the computer for children and the uninitiated. In this regard, it fills the role of changing the computer into a friendly, helpful tool, and makes simple the production of pictures that can be, frankly, quite stunning. The manufacturer also suggests that the tablet be used as a game controller; but you should note that it would only work if the game were equipped to read it properly. I expect it would replace paddles, but not a joystick, in most games.

Finally, the tablet can be used by the experienced programmer as an input device to the computer. For those who are interested, the X and Y coordinates of the location being pressed on the tablet surface are interpreted by the analog-digital converters in the sound interface chip, and can be read as integers from 1 to 255 at locations 54297 and 54298. The two pushbuttons are read as the left and right joystick movements at location 56321.

In summary, the KoalaPad alone is a useful input device for any computer. Teamed with the Koala Painter software that is supplied, it converts your computer and its untamed graphics potential into a friendly, powerful drawing tool that could turn the most untechnical person into a computer lover.



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The Koala Pad
Part II: USING "KOALA PAINTER" PICTURE FILES (FOR ADVANCED PROGRAMMERS)

Koala Painter is a picture drawing utility for generating multicolor hi-resolution screens and is packaged with the KoalaPad. The software and hardware are well integrated and easy to use. The user can produce some fantastic graphics using this package. Overall I give this combination an excellent rating.

In my opinion, however, the hardware and software package has limited utility for the serious user, once the novelty wears off, unless the pictures created can be used in other programming applications. Although the manual explains how to store and load pictures from disk using the Koala Painter software, it does not adequately describe the structure of a picture data file itself so that a knowledgeable programmer can access it for other uses.

GAINING ACCESS TO THE FILES

The file structure of Koala Painter picture data, as I have determined it, is shown in Table 1. (Both decimal and hex addresses are given.) From this information I have written a specialized program that enables you to work with the picture files.

The program listing KPAINT.BAS is a utility for reading the picture files into memory, viewing the picture, and saving the picture using various file options. Looking at the load map in Table 1, we see that the file is loaded across a bank boundary. We have the option of moving the 8000 HIRES bytes up one bank, or moving the 1000 video pointers down a bank. I chose the latter, due to BASIC speed considerations.

There is some delay when switching between the normal screen and the picture. This is due to the fact that we need to manage the color nibble memory starting at 55296 (D$800). I used white characters in the program to illustrate this point. We can have any number of HIRES screen and video screens in memory, but there is only one set of color nibble latches. Every time we change a video screen, we need to rewrite the color nibbles. In the program example, I copy the file nibbles when going to view a picture and clear the nibbles when returning to the menu screen. If I were using something more complex than a menu screen, such as another picture, I would have to rewrite the color nibbles rather than using a simple clear routine.

To load a program, the menu will prompt for a letter in the range of 'A' thru 'O'. A directory listing will be handy, as the program does not provide directory service. If you give a letter for a file that is not on the disk, the BASIC error routines will abort the program and leave you in the HIRES mode. You will then have to RESTORE the machine.

The save routines may seem rather complex at first glance. The first menu asks for the file type PROGRAM, USER or SEQUENTIAL. The PROGRAM and USER file options will produce loadable files and the SEQUENTIAL option will produce a read only file. The USER option is included as some programmers like to designate loadable data files as USER files. (The USER files could be of either format. If you wish USER sequential files rather than USER program files, then the appropriate changes could be made to the program.)

The second menu during SAVE asks if you wish a single file or multiple files. If you select the single file option, then all 10,001 bytes will be put into a single file in the same sequence as the KOALA PAINTER file. If you chose multiple files, then three files will be generated – one each for the HIRES bit pairs, the color pointers and the color nibbles.

Selecting the multiple file option will activate a third menu to determine where the background color byte is to go. It can be appended to any of the three files, or omitted. I could have generated another file for this byte, but I think that would have been overkill.

During the SAVE process, if we have selected the PROGRAM or USER option, we will be asked for a load address. If we have further selected the multiple file option we will need to have calculated three load addresses. The load address will allow us to load the files into predetermined memory areas. For example, the color nibble segment could be designated to load directly into the color nibble area starting at 55296 (D$800). (This is also a good reason for not appending the background color byte to the nibble file.)

I have by no means exhausted the possible file structures. The intent of this article was simply to outline the structure of the KOALA PAINTER picture files and provide a way to extract the data into one of several useful file formats. The user could then design further utilities or menu options to crunch the files into a more compact form or transpose the data structures.

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TABLE 1
KOALAPAINTER
FILE STRUCTURE

LOAD ADDRESS: 24576 $6000
FILE LENGTH: 10,001 BYTES
HIRES BIT PAIRS 24576-32575
$6000-$7F3F
COLOR POINTERS 32576-33575
$7F40-$8327
COLOR NIBBLES 33576-34575
$8328-$870F
BACKGROUND COLOR BYTE
34576 $8710

KPAINT.BAS

```
100 REM 'KPAINT.BAS'
110 :
120 REM COPYRIGHT 1983 G.R. GAUKEL
130 :
140 IF X THEN 860
150 :
160 REM USING KOALAPAINTER FILES
170 REM WITH A BASIC PROGRAM
180 :
190 GOTO 1180 :REM INITALIZE
200 :
210 REM *** COMMAND LOOP ***
220 :
230 IF FLAG=1 THEN 310
240 PRINT H$
250 PRINT"[F1] TO SEE KOALA
260 PRINT"[F3] NORMAL SCREEN
270 PRINT"[L]  LOAD PICTURE
280 PRINT"[S]  SAVE FILE(S)
290 PRINT"[Q]  TO END PROGRAM
300 :
310 GOSUB 390
320 IF IN$=CHR$(133)THEN GOSUB430
330 IF IN$=CHR$(134)THEN GOSUB570
340 IF IN$="Q" THEN GOSUB570 :END
350 IF IN$="S" THEN GOSUB 1340
360 IF IN$="L" THEN 710
370 GOTO230
380 :
390 GET IN$ : IF IN$="" THEN 390
400 RETURN
410 :
420 REM *** SHOW THE PICTURE ***
430 IF FLAG=1 THEN RETURN
440 GOSUB 480
450 FLAG=1 : GOSUB 980
460 RETURN
470 :
480 POKE 53280,PEEK(FC)
490 POKE 53281,PEEK(FC)
500 POKE 53265,59
```

```
510 POKE 53270,216
520 POKE 53272,120
530 POKE 56576,PEEK(56576)AND254
540 RETURN
550 :
560 REM *** MENU SCREEN ***
570 IF FLAG=0 THEN RETURN
580 GOSUB 620
590 FLAG=0 : GOSUB 980
600 RETURN
610 :
620 POKE 53280,14
630 POKE 53281,6
640 POKE 53265,27
650 POKE 53270,200
660 POKE 53272,21
670 POKE 56576,PEEK(56576)OR1
680 RETURN
690 :
700 REM *** LOAD PICTURE ***
710 GOSUB 570
720 PRINT"LETTER INDEX 'A-O' ";
730 GOSUB 390 :PRINTIN$
740 IF IN$<"A" THEN 720
750 IF IN$>"O" THEN 720
760 A$=CHR$(129)+"PIC "+IN$+"*"
770 POKE 53280,6
780 REM WATCH IT LOAD
790 GOSUB 480 : FLAG=1
800 :
810 REM LOADS AT 24576 ($6000)
820 OPEN15,8,15,"IO" :CLOSE15
830 X=2 :LOADA$,8,1
840 :
850 REM SET COLOR STORAGE
860 POKE 53280,14
870 FORI=0TO999
880 POKERP+I,PEEK(FP+I) :REM PTRS
890 POKERN+I,PEEK(FIN+I) :REM NIBBS
900 NEXT
910 ZZ=PEEK(FC):REM SET BACKGROUND
920 POKE 53280,ZZ
930 POKE 53281,ZZ
940 GOTO230
950 :
960 REM *** VIDIO POINTERS ***
970 :
980 IF FLAG=0 THEN 1090
990 :
1000 REM VIEW PICTURE
1010 POKE 53281,14
1020 FOR I=0TO999
1030 POKE RN+I,PEEK(FIN+I)
1040 POKE 53280,PEEK(FC)
1050 POKE 53281,PEEK(FC)
1060 NEXT
1070 RETURN
1080 :
1090 REM MENU SCREEN
1100 POKE 53281,14
1110 FOR I=0TO999
1120 POKERN+I,1 :REM WHITE
1130 NEXT :POKE 53281,6
1140 RETURN
```


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```
1150 :
1160 REM *** INITALIZE ***
1170 :
1180 REM LOWER TOP OF MEMORY
1190 :
1200 PRINTCHR$(147)CHR$(5)
1210 SA=24576 :REM $6000 LOAD ADDR
1220 :
1230 FP=32576 :REM $7F40 FILE PNTRS
1240 FIN=33576 :REM $8328 FILE NIBS
1250 FC=34576 :REM $8710 BACKGROUND
1260 RP=23552 :REM $5C00 RAM PNTRS
1270 RN=55296 :REM $D800 RAM NIBS
1280 BC=34576 :REM $8710 BACKGROUND
1290 H$=CHR$(147)+CHR$(17)+CHR$(17)
1300 GOTO230
1310 :
1320 REM *** SAVE FILE(S) ***
1330 :
1340 GOSUB570 :PRINTH$
1350 :
1360 REM FILE TYPE
1370 PRINT:PRINT"FILE TYPE :"
1380 PRINT"[P] PROGRAM"
1390 PRINT"[U] USER"
```

```
1400 PRINT"[S] SEQUENTIAL ";
1410 GOSUB 390 :PRINTIN$
1420 IF IN$="P" THEN 1460
1430 IF IN$="U" THEN 1460
1440 IF IN$="S" THEN 1460
1450 GOTO1370
1460 EXT$=IN$
1470 :
1480 REM FILE STRUCTURE
1490 PRINT:PRINT"FILE STRUCTURE :"
1500 PRINT"[S] SINGLE FILE"
1510 PRINT"[M] MULTIPLE FILES ";
1520 GOSUB 390 :PRINT IN$
1530 IF IN$="S" THEN 1560
1540 IF IN$="M" THEN 1560
1550 GOTO 1490
1560 TYPE$=IN$
1570 :
1580 IF EXT$="S" THEN1760
1590 :
1600 REM BACKGROUND COLOR OPTION
1610 PRINT
1620 PRINT"BACKGND COLOR OPTION :"
1630 PRINT"[O] OMIT FROM FILES"
1640 PRINT"[N] APPEND NIBBLES"
1650 PRINT"[P] APPEND POINTERS"
1660 PRINT"[H] APPEND HIRES BITS ";
1670 GOSUB 390 :PRINT IN$
1680 IF IN$="O" THEN 1730
1690 IF IN$="N" THEN 1730
1700 IF IN$="P" THEN 1730
1710 IF IN$="H" THEN 1730
1720 GOTO 1610
1730 OPT$=IN$
1740 :
1750 REM FILE NAME(S)
1760 PRINT
1770 INPUT"FILE NAME :";NA$
1780 IF LEN(NA$)<10 THEN 1850
1790 PRINT"FILE NAME TOO LONG";
1800 PRINT" 10 CHARACTERS MAX"
1810 GOTO1760
1820 :
1830 REM CONTINIOUS FILE
1840 :
1850 IF TYPE$="M" THEN 1930
1860 FL$=NA$ :WRITE=0 :CALL=0
1870 X=SA :XX=X+1E4
1880 GOSUB 2110
1890 RETURN
1900 :
1910 REM MULTIPLE FILES
1920 :
1930 FL$="PNTRS."+NA$
1940 X=FP :XX=X+1E3-1 :CALL=1
1950 IF OPT$="P" THEN WRITE=1
1960 GOSUB2110
1970 :
1980 FL$="NIBBS."+NA$
```


VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20 VIC-20

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```
1990 X=FIN :XX=X+1E3-1 :CALL=2
2000 IF OPT$="N" THEN WRITE=1
2010 GOSUB2110
2020 :
2030 FL$="HIRES."+NA$
2040 X=SA :XX=X+8E3-1 :CALL=3
2050 IF OPT$="H" THEN WRITE=1
2060 GOSUB2110
2070 RETURN
2080 :
2090 REM WRITE DISK FILE
2100 :
2110 OPEN8,8,8,"0:"+FL$+","+EXT$+"
     ,W"
2120 IF EXT$="S" THEN 2140
2130 GOSUB2250 :REM LOAD ADDR
2140 FOR I = XTOXX
2150 BY$=CHR$(PEEK(I))
2160 PRINT#8,BY$;
2170 NEXT
2180 BY$=CHR$(PEEK(BC))
2190 IF WRITE THEN PRINT#8,BY$;
2200 WRITE=0
2210 CLOSE8 :RETURN
2220 :
2230 REM LOAD ADDRESS
2240 :
2250 PRINT
2260 IF CALL THEN GOSUB2400
2270 INPUT"LOAD ADDRESS :";AD
2280 AD=ABS(INT(AD))
2290 IF AD>64512 THEN 2320
2300 IF AD<1024  THEN 2320
2310 GOTO2340
2320 PRINT"RANGE 1024-64512"
2330 GOTO2250
2340 AH=INT(AD/256)
2350 AL=INT(AD-(AH*256))
2360 PRINT#8,CHR$(AL);
2370 PRINT#8,CHR$(AH);
2380 RETURN
2390 :
2400 IF CALL=1THEN PRINT"POINTER ";
2410 IF CALL=2THEN PRINT"NIBBLE ";
2420 IF CALL=3THEN PRINT"HIRES ";
2430 CA=0
2440 RETURN
```

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Data Organization for the VIC-20: PART IV

By Arthur J. Dudley

In previous issues, I described how integers, floating point reals, and strings are stored in memory. To conclude this series, I will describe how these three types of variables are stored in arrays. However, prior to starting, a quick review of the February 1984 article is in order.

You were given a division problem and asked to input an answer rounded to two decimal places. Entering the correct answer (3.02) would result in an incorrect response. The problem was to determine, after displaying the contents of variable "Z" (the computer's calculated answer) and variable "A" (your answer), why an incorrect response was displayed when both variables appeared to equal 3.02.

To arrive at a solution, the memory dump program should be used. This allows you to see the actual contents of the two variables in question.

Both variables are identical except for the least significant byte (a 20 for variable "A", and a 21 for variable "Z"). Refer to Figure 1. The actual value of variable "Z" is 3.019999999 . . . . Because the VIC can only display 9 significant digits, the above value is rounded to 3.02 prior to being displayed. Since conditional statements compare the *actual* contents of memory rather than what is seen on the screen, the two variables in fact contain different values, as far as the computer is concerned.

This problem can be resolved by using the INT function on both the "Z" and "A" variable. Change line 2 of last installment's program as follows:

```
2 INPUT A: A=INT(A*100+.5) / 100
```

Keep this method in mind when writing programs dealing with rounded variables used in conditional statements.

Before I begin describing data organization of arrays, load and RUN your memory dump program (insure the division subroutine is removed). Next, enter your name and press "A" to branch to the array section of memory.

The systems for storing arrays and non-array values are similar. The only difference is that additional information is included with arrays. This allows the interpreter to access the individual array elements.

INTEGER ARRAYS

Below is a list of values assigned to array "L" in line 7 of the memory dump program.

```
L%(0)=0
L%(1)=1
L%(2)=2
L%(3)=3
L%(4)=4
```

Refer to Figure 2 while reading the following explanation.

FIGURE 1

90	Z	Variable Z	65	A	Variable A
0			0		
130	Exponent		130	Exponent	
65	MSB		65	MSB	
71			71		
174		Mantissa	174		Mantissa
(20)	LSB		(21)	LSB	

Bytes one and two contain the name of the array, which is formed in the same fashion as non-array variables. Next are two bytes indicating the offset or size of the array. There is one offset per dimension. The first byte of the offset is the LSB and the second byte is the MSB. As always, the MSB represents multiples of 256. An MSB of 0 and an LSB of 17 represent an offset of 17 [(0 × 256) + 17]. Byte five stores the total amount of dimensions in the array; and bytes six and seven indicate the amount of elements contained in the array, with byte six as the MSB and byte seven as the LSB [(0 × 256) + 5 = 5 elements].

The remaining portion of the array contains the elements themselves. Each element consists of only two bytes (LSB and MSB), whereas non-array integer variables also include three extra unused bytes. These extra non-essential bytes are deleted from an array configuration, thus saving valuable memory space. Individual elements of an array are handled the same as non-array variables.

FLOATING POINT ARRAYS

Floating point arrays are configured in the same fashion as integer arrays with the exception of using five bytes per element instead of two. Figure 3 shows a partial display of array "M". Because floating point arrays are so similar to integer arrays there is no need of an explanation. If a review of the element configuration is desired, refer to my second article.

STRING ARRAYS

The first seven bytes of a string array have the same format as integer and floating point arrays. Bytes one and two contain the array name. Bytes three and four the offset. Byte five the number of dimensions, and bytes six and seven the number of elements. The remaining bytes are the actual elements. Refer to Figure 4.

Just as in non-array strings, the elements contain the length and address where the actual string is stored. Element #1 is one character in length and is stored at address 4252 [(16 × 256) + 156]. The assignment N$(1)="A" is made in line 7 of the memory dump program. Press "J" and enter address 4252 to see the actual string located in the program section of memory.

MEMORY SAVING TECHNIQUES

The following tips concern the use of variables and arrays.

1. Use arrays whenever possible. For example: If 10 floating point reals are stored in an array, a savings of 13 bytes can be obtained. Ten values (floating point reals) stored as non-array variables will occupy 70 bytes of memory (10 variables × 7 bytes per variable = 70 bytes). Storing the same 10 values in an array will occupy only 57 bytes (7 bytes of array identification + 10 elements × 5 bytes per element = 57 bytes).

2. Integer Arrays will save 3 bytes per element over floating point arrays. Integer variables and floating point reals used in non-array configurations will occupy the same amount of memory.

3. Since variable names are two bytes long, any portion exceeding this length is not used. Therefore, to avoid wasting space in the program section of memory, attempt to limit variable names to two characters.

4. It is a good practice to dimension arrays below eleven elements even though it is not required. Example: If a three element array is not dimensioned in a program, the interpreter will automatically dimension an array of eleven elements upon initializing the first element. This results in reserving memory for eight more elements than required. By using the DIM statement, you can reserve the *exact* amount of memory space needed.

As promised in the last month's article, I have included an append program and a modified memory dump program. The append program can be used to merge two BASIC programs into one.

After entering and saving the Append Program shown in Listing 1, follow the below instructions:

1. LOAD and RUN the append program.
2. The statement "PRESS PLAY ON TAPE"should appear on your screen. Ignore any other statements.
3. Place the cassette containing your first program into your cassette player and press PLAY. Note: Advance or rewind the tape as nec-

Figure 2

BYTE	ADDRESS*			
1	4972	204	L	Array Name
2	4973	128		
3	4974	17	LSB	Offset
4	4975	0	MSB	
5	4976	1	# of Dimensions	
6	4977	0	MSB	
7	4978	5	LSB	# of Elements
8	4979	0		
9	4980	0		L% (0)=0
10	4981	0		
11	4982	1		L% (1)=1
12	4983	0		
13	4984	2		L% (2)=2
14	4985	0		
15	4986	3		L% (3)=3
16	4987	0	MSB	
17	4988	4	LSB	L% (4)=4
		Values Assigned to each element		

*Addresses shown may differ from those on your screen.

FIGURE 3

Address*			
4989	77	M	Array Name
4990	0		
4991	32	LSB	Offset
4992	0	MSB	
4993	1	# of Dimensions	
4994	0	MSB	
4995	5	LSB	# of Elements
4996	0		
4997	0		
4998	0		M(0)=0
4999	0		
5000	0		
5001	129	Exponent	
5002	0		
5003	0	Mantissa	M(1)=1
5004	0		
5005	0		
.	.		
.	.		
.	.		

*Addresses shown may differ from those on your screen.

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FIGURE 4

Address*			
5042	78	N	Array Name
5043	128		
5044	22	LSB	Offset
5045	0	MSB	
5046	1	# of Dimensions	
5047	0	MSB	
5048	5	LSB	# of Elements
5049	0		
5050	0		
5051	0		
5052	1	Length	
5053	156	LSB	N$(1)="A" (16×256)+156=4252
5054	16	MSB	(Address)
.	.		
.	.		
.	.		

* Addresses shown may differ from those on your screen.

essary to insure the program of your choice is next on the tape.
4. After your first program has been loaded, press STOP on your cassette player and enter RUN to load your second program.
5. Repeat step number three using your *second program*. Note: Steps 4 and 3 can be repeated to append any number of programs as long as you do not exceed memory limitations.
6. Delete lines one through four of the append program.
7. Insure there are no duplicate line numbers in your appended programs. Make any necessary corrections.

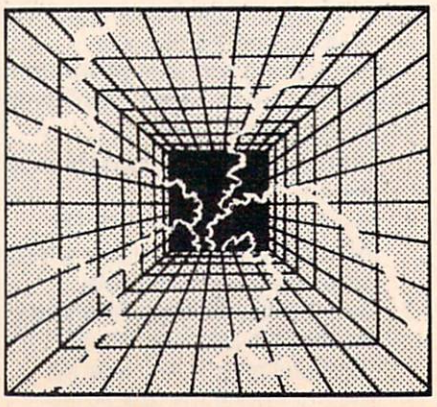
The memory dump program in Listing 2 is a modified version of the original one listed in last November's *COMMANDER*. Changes include:

1. Renumbered lines (Program begins at line number 60000).
2. All variables end in zero (A0, B0. . .). This avoids confusing memory dump variables with main program variables.
3. A few minor problems with the original version have been corrected. Note: Variable names displayed in column three are correct only for the variable's section of memory. If you branch out of this section, the third column can be ignored.

If you are going to append the memory dump program with another program of your choice, the sequence below should be followed:

1. Load and run the append program.
2. Load/append the programs of your choice.
3. Load/append the memory dump program last.
4. Delete lines one through four of the append program.
5. Check for duplicate line numbers.
6. When you decide to use the memory dump subroutine, enter GOTO 60000. Remember, DO NOT enter RUN 60000 for this will clear all variables you wish to inspect.

The topic I just covered is but a small fraction of what can be learned by exploring VIC's memory. If you have just bought a VIC-20, I suggest purchasing a memory map of the VIC (there is one in the Programmer's Reference Guide) to do some exploring on your own, and before long, you will discover a great wealth of information.



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LISTING 1
APPEND PROGRAM

```
1 X=PEEK(44):POKE198,6

2 PRINT''[clr][down, 3 times]
  LOAD[down, 10 times][left,
   3 times]POKE44,''X'':POKE4
  3,1'';''[home]'':FORJ=631TO
  636:POKEJ,13:NEXT

3 POKE198,6:A=PEEK(46)*256+PE
  EK(45)-2

4 POKE44,(A/256):POKE43,A-INT
  (A/256)*256:END
```

LISTING 2
MODIFIED MEMORY DUMP PROGRAM

```
60000 AO$=''1'':BO=PEEK(46)*256+PE
      EK(45):DO=7:PRINT''[clr]''

60080 FORJO=BOTO65535

60090 PRINTJO;TAB(7)PEEK(JO);:IFD
      O=7THENDO=0:GOTO60100

60093 IFDO=1THENGOTO60100

60095 PRINT:GOTO60120

60100 IFPEEK(JO)=>128ANDAO$=''1''
      THENGOSUB61000

60102 IFPEEK(JO)<128ANDPEEK(JO)>4
      7THENPRINTTAB(14)CHR$(PEEK(
      JO))

60103 IFPEEK(JO)<48ANDAO$=''1''TH
      ENPRINT

60104 IF AO$=''O''AND(PEEK(JO)>=1
      28ORPEEK(JO)<=47)THENPRINT

60120 CO=CO+1:DO=DO+1:IFCO<21THEN
      60161

60150 GETXO$:IFXO$=''''THEN60150

60152 IFXO$=CHR$(94)THENDO=7:JO=J
      O-42

60153 PRINT''[clr]''

60155 IFXO$=''J''THENAO$=''O'':GO
      SUB62000

60156 IFXO$=''R''THENJO=BO-1:DO=7
      :CO=0:AO$=''1''

60157 IFXO$=''E''THENEND

60158 IFXO$=''A''THENJO=PEEK(48)*
      256+PEEK(47)-1:DO=7:CO=0:AO
      $=''O''

60159 IFXO$=''S''THENJO=PEEK(52)*
      256+PEEK(51)-1:AO$=''1''

60160 CO=0

60161 IFJO>=PEEK(48)*256+PEEK(47)
      THENAO$=''O''

60169 IFJO>=PEEK(48)*256+PEEK(47)
      THENDO=7

60170 NEXT:END

61000 PRINTTAB(14)CHR$(PEEK(JO)-1
      28):RETURN

62000 INPUT''[clr]ADDRESS'';EO:JO
      =EO-1:RETURN
```

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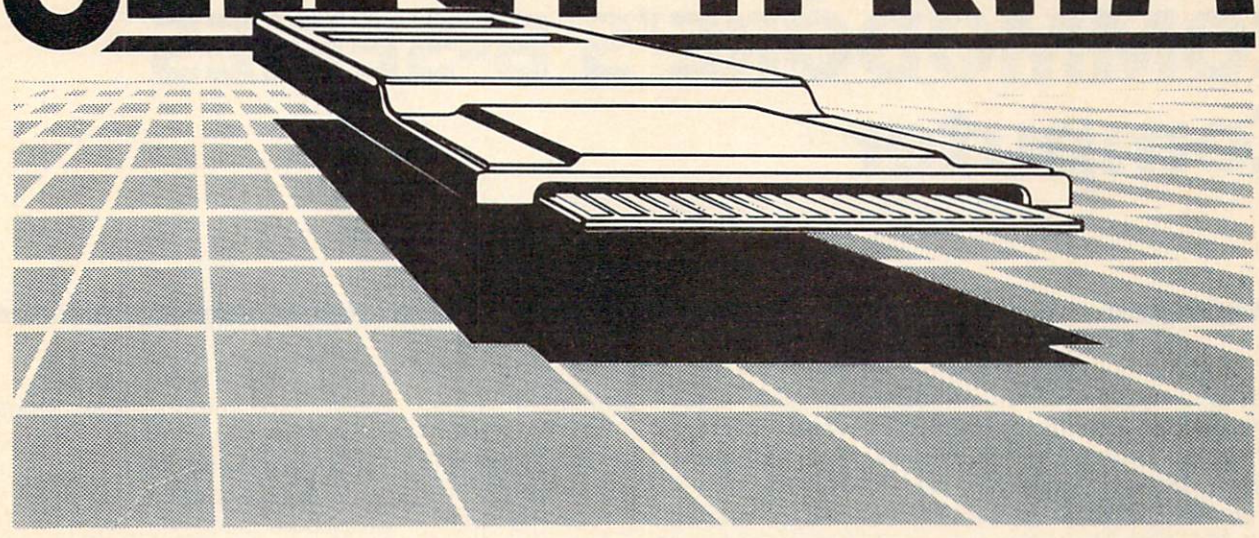

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Introducing COMMODORE'S B-SERIES Computer

By Howard Rotenberg
Commodore Business Machines, Canada

The long-awaited B-SERIES computer has finally arrived. It is the computer that many people previously referred to as the P-500, B-700, and various other names. The product is called either the B-128 or the B-256 according to the amount of memory that the computer contains. Most of the information provided here is applicable to both models. Incorporated into the new B-Series are an Extended BASIC, Extended Memory Support, Error Trapping, RS232 Interface, Advanced Editing, Advanced Monitor commands with DOS support, special function keys and many other enhancements. The processor used in this computer, the 6509, lets you address up to one megabyte (one million bytes) of memory. It is accessed as 16 individual banks of 64 bytes. The speed of the computer's processing and I/0 has improved since the CBM 8032, which had been considered Commodore's "business" computer. There is also an option to run an extra processor within the computer, as well as CP/M 86 capability.

A NEW STREAMLINED LOOK

When discussing this new computer, a good place to start would be from the outside. The B-Series computer has a slick, streamlined, futuristic look. It has 94 keys, with that rich feel that was previously available only on larger development systems. Some of the functions of these keys have not been offered on Commodore computers before. The numeric keypad is laid out for quick and accurate entry of numbers. It also incorporates arithmetic operators for ease of mathematical operations. It has an ENTER key, and one key that has "00" on it. This key will literally print two zeros, which is handy when using large numbers. The key that I find most useful is the CE or clear-entry key. This key will delete the last number that you have entered. For example, if you entered 456 + 120 and wanted to change the 120 to another number, you would otherwise have to press the delete key three times. Now with the CE key, you just need to press it once and the 120 is cleared. The parser for the CE key is smart enough that even if you enter a calculation such as 456+120 with no spaces and then press the CE key, it will only delete the 120. If you press it once more it deletes the plus sign, and the third time it clears the 456.

Moving to the left we find the main keyboard. It contains all the alpha-numerics and various other symbols such as brackets, percent sign, etc. There is an ESCape key that can be used in conjunction with each of the 26 alphabetic keys for a wide variety of editing functions, as listed below.

A) Automatic insert
B) Set bottom
C) Cancel automatic insert
D) Delete line
E) Nonflashing cursor
F) Flashing cursor
G) Enable bell (turn it on)
H) Disable bell (turn it off)
I) Insert line
J) Move to start of line
K) Move to end of line
L) Enable scrolling
M) Disable scrolling
N) Normal screen
O) Cancel insert, quote and reverse
P) Erase to start of line
Q) Erase to end of line
R) Reverse screen
S) Solid cursor
T) Set the top of the page
U) Underscore cursor
V) Scroll up
W) Scroll down
X) Cancel escape sequence
Y) Normal character set
Z) Alternate character set

The keys have graphic symbols printed on them for easy access. Holding down the CTRL key will slow down scrolling, while pressing the Commodore key will stop scrolling completely until another key is pressed. There are some format keys that allow you to switch between normal and graphics mode as well as a reverse-graphics key. The regular editing keys such as a cursor movement and CLR/HOME are all present.

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F1) "PRINT"
F2) "LIST"
F3) "DLOAD" + CHR$(34)
F4) "DSAVE" + CHR$(34)
F5) "DOPEN"
F6) "DCLOSE"
F7) "COPY"

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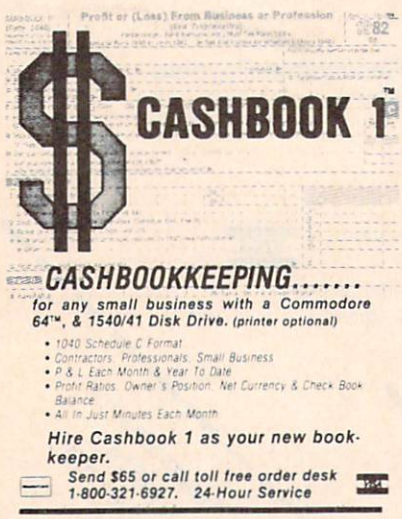
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F8) "DIRECTORY"
F9) "SCRATCH"
F10) "CHR$("

The use of these keys is limited only by your imagination and the 160 characters. With the proper syntax, you may have a key defined to do any batch of commands that may normally be executed in the immediate mode. An example is KEY11, "DSAVE" + CHR$(34) + "@:TEST" + CHR $(34) + CHR$(13). This will enable you to replace the program call test simply by typing the F11 (SHIFTED F1) key. Finally, we come to the back of the computer. The ports available are an IEEE, audio out, cartridge, cassette (although not implemented), video out and a true RS-232 port. There is an internal user port that may be accessed if you need it.

Well, that should give you a sense of the new design and keyboard functions of the B-Series. From here we will go on to explore the Extended BASIC commands that are available.

EXTENDED BASIC

There have been a number of extensions to the BASIC interpreter. Some of these commands will allow a more structured program while others will do error trapping and generally allow easier programming. All the BASIC 4.0 commands are present, so I will just deal with the new ones or any that have changed. The following is a list of the new commands and a quick explanation and example of their use.

BANK

In the B-Series computers, there are either two or four 64K memory banks for the 128 and 256 series respectively. I will discuss the use of these banks a bit later. The use of the bank command is to set the bank for the POKE, PEEK, and SYS command. For example:

```
10 REM SET BANK NUMBER
20 BANK 3
30 REM STORE DECIMAL 20 AT
   LOCATION 1024 IN BANK 3
40 POKE 1024,20
```

BLOAD/BSAVE

Once again this command is used to reference the different 64K banks in the computer. This time they are for loading or saving a binary file to/from any location in memory.

```
10REM LOAD TEST INTO BANK 3
   FROM DRIVE 0 STARTING AT
   MEMORY LOCATION 1024
20 BLOAD "TEST",D0 ON B3, P1024
30 REM SAVE TEST FROM BANK 3,
   DRIVE 1 FROM MEMORY LOCATION
   512 TO 1024
40 BSAVE "TEST", D1, B3, P512 TO
   P1024
```

POKE/PEEK

This command has only changed in the respect that you may now use it to look at or change locations in other banks. The default is bank 1, which is the BASIC text bank, or the bank in which your written program resides. The following is an example showing how to use these commands for other banks.

```
10 REM SET TO BANK 3 AND THEN
   ALTER MEMORY LOCATION 1024
20 BANK 3: POKE 1024,52
30REM SET TO BANK 3 AND DISPLAY
   THE CONTENTS OF MEMORY
   LOCATION 1024
40BANK 3: PRINT PEEK (1024)
```

SYS/USR

These commands have not changed much except that the SYS command is used in conjunction with the bank command and the USR command calls a machine language routine with it's starting address stored at locations 3 and 4 of bank 15. The expression in brackets is stored in the floating point accumulator prior to entering the subroutine.

```
10 REM CALL A MACHINE LANGUAGE
   ROUTINE IN BANK 3 AT DECIMAL
   ADDRESS 512
20 BANK 3: SYS 512
30REM CALL A MACHINE LANGUAGE
   ROUTINE ACCORDING TO THE
   ABOVE EXPLANATION
40 X = USR(5)
```

FRE

This command will return the number of free bytes of the bank or segment specified by the parameter in brackets. An invalid parameter returns a 0.

```
10REM RETURN FREE MEMORY
   IN BANK 3
20 PRINT FRE(3)
30 REM RETURN FREE MEMORY
   IN BANK 1
40 PRINT FRE(1)
```

DELETE

This command will delete a range of line numbers from the user's BASIC program. The parameters are the same as those used in LIST.

```
10 REM DELETE LINES 50 TO 150
   IN OUR PROGRAM
20 DELETE 50-150
30 REM  DELETE THE ENTIRE
   PROGRAM
40 DELETE-
```

NOTE: When deleting the entire program, it actually erases all of memory. It does not

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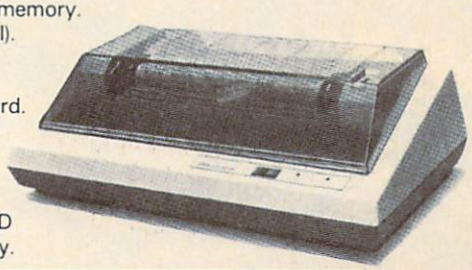

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	Character Spacing	10 characters/inch
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just reset the pointers and place three zeros at the start of the program. This means that it is absolutely irreversible.

DIRECTORY

This will display the directory of the desired disk. If the screen is about to scroll, it stops the display and prompts you with (more). Pressing any key except stop will resume the display. The directory command will take an optional filename or a * as a wildcard and search for those occurrences.

```
10 REM DISPLAY PROGRAM TEST IF
IT
    EXISTS (DEFAULT DRIVE 0)
20 DIRECTORY "TEST"
30 REM DIPLAY PROGRAMS THAT
    START WITH A DEFAULT DRIVE 0
40 DIRECTORY "D*"
50 REM DISPLAY BOTH DIRECTORIES
60 DIRECTORY
70 REM DISPLAY DIRECTORY OF
    DRIVE 0
80 DIRECTORY ,D0
90 REM DISPLAY DIRECTORY OF
    DRIVE 1
95 DIRECTORY ,D1
```

INSTR:

This command will match the occurrence of B$ in A$ with an optional starting position of N. It will return the starting position or 0 if not found.

```
10 LET A$ = "ABCDEF"
20 LET B$ = "CD"
30 REM THIS WILL RETURN THE
    NUMBER 3
40 PRINT INSTR(A$,B$)
50 REM THIS WILL RETURN THE
    NUMBER 0
60 PRINT INSTR(A$,B$,4)
70 PRINT INSTR("COMMODORE",
    "MOD")
```

IF-THEN-ELSE

This command structure will allow us to use more structured statements within our programs. If condition #1 is true then the following commands are executed until a branch or the end of the line is reached. If it is false then the commands following the else will be executed.

```
10 LET A$ = "CBM": LET C$ = "PET"
20 REM THIS WILL PRINT YES
30 IF A$ = "CBM" THEN PRINT
"YES":
    ELSE PRINT "NO"
40 REM THIS WILL PRINT NO
50 IF A$ = "HELLO" THEN PRINT
    "YES":ELSE PRINT "NO"
60 REM IF A$ = C$ THEN GO TO
    LINE 10 OR IF NOT EQUAL GO TO
    LINE 90
70 IF A$ = C$ THEN GOTO 10:ELSE
    90
```

```
80 PRINT "THIS LINE WILL NOT BE
   EXECUTED"
90 PRINT "A$ WAS NOT EQUAL TO
   C$"
```

KEY

This is used to define the function keys that I had previously discussed. The contents of the defined keys may be seen by typing KEY.

```
10 REM DEFINE KEY 11 TO PRINT
   GOSUB WHEN PRESSED
20 KEY 11, "GOSUB"
30 REM DISPLAY ALL DEFINED KEYS
40 KEY
```

TRAP

This command will disable the BASIC error handling routines and let you handle the error yourself. This command is usually used with the reserved variables EL, ER, ERR$, and RESUME, which will be discussed shortly.

```
10 REM SET THE LINE THAT BASIC
   WILL GO TO IF AN ERROR OCCURS
20 TRAP 95
30LET A$ = ""
40 REM THE NEXT LINE IS AN ERROR
50 PRINT ASC(A$)
60 REM THE NEXT LINE WILL NOT BE
   EXECUTED YET
80 PRINT "WE WILL NOW CONTINUE
   SINCE THE ERROR HAS BEEN
   TRAPPED"
90 STOP
95 PRINT "OUR PROGRAM CAME
   HERE INSTEAD OF PRINTING
   ?ILLEGALQUANTITY IN 50
99 GOTO 80
```

RESUME

This statement is used in conjunction with TRAP. It specifies where execution will continue after an error has been trapped. If no options are specified it will try to re-execute the statement in error. You may use the next option which will cause it to resume execution after the statement in error. If a line number is used, then it will proceed from there.

```
10 TRAP 60
20 LET A$ = ""
30 PRINT ASC(A$)
40 PRINT "THE PROGRAM
   CONTINUED AT THIS POINT AFTER
   RESUME NEXT"
50 STOP
60 PRINT "THE ERROR WAS TRAPPED
   HERE"
70 PRINT "WE WILL NOW GO BACK
   TO THE STATEMENT AFTER THE
   ONE IN ERROR"
80 RESUME NEXT
```

DISPOSE

This command will allow a user to terminate a FOR-NEXT loop or jump out of a

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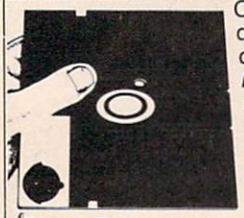

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subroutine without leaving garbage on the stack. An ideal use would be during an error trapping routine.

```
10 FOR J=1 TO 10
15 PRINT J
20 IF J=5 THEN DISPOSE FOR: GOTO
   30
25 NEXT J
30 PRINT "OUR LOOP WAS
   TERMINATED PREMATURELY AND
   THE STACK LEFT CLEAN"
35 REM EXAMPLE OF A GOSUB
40 GOSUB 60
45 PRINT "A NORMAL RETURN WAS
   EXECUTED":END
50 PRINT "WE HAVE RETURNED WITH
   A CLEAN STACK WITHOUT A
   RETURN"
55 END
60 INPUT "ENTER A NUMBER";N
65 IF N  10THEN DISPOSE GOSUB:
   GOTO 50
70 RETURN
```

ERR/EL/ER

These are the new reserved variables that I had mentioned earlier. ERR$ will return an error message determined by a parameter. The valid parameters are 0 to 42. When the variables EL and ER are used with TRAP, EL will hold the line number with the error, while ER will contain the correct error number used by ERR$.

```
10 REM DISPLAY A BASIC MESSAGE
20 PRINT ERR$(1)
30TRAP 70
40 PRINT ASC(A$)
50 PRINT "WE HAVE RETURNED
   FROM THE ERROR ROUTINE"
   60 END
70 PRINT "ERROR IN LINE" EL
80 PRINT "THE ERROR IS" ERR$(ER)
90 RESUME NEXT
```

PRINT USING

This is the command that will probably be most appreciated by the majority of users. It will provide formatted printing to the screen or a logical device. The format symbols that may be used are:#,+,–,., comma,$,= and the exponential sign. The way to print to a file would be PRINT[#file], using clause; print list. An example of this would be PRINT#4, using "$####.##";1000. This will result in the figure $1000.00 sent to that file. The format clause may be put into a string such as A$ = "$####.##". In the following examples an exclamation mark has been used instead of an exponential sign. In practice you should use the exponential sign.

```
10 PRINT USING "+##";1: REM
   PRINT UP TO TWO CHARACTERS
20 PRINT USING "#.##+";-.01:PRINT
   SIGN IN THE + POSITION
30 PRINT
USING"#,###.##";1000.009:
   REM ROUNDED UP
40 PRINT USING "$###.##";100.00:
   REM ADD $ AND DECIMAL
50 PRINT USING "$###,###.##";
   10000.00: REM ADD A COMMA
   FOR EASY READING
60 PRINT USING"##.##! ! ! !";100000:
   REM PRINT IN SCIENTIFIC NOTATION
70 PRINT USING"######  ";"CBM":
   REM RIGHT JUSTIFIED
80 PRINT USING"########";"CBM":
   REM LEFT JUSTIFIED
90 PRINT USING "=#######;"CBM":
   REM CENTERED
```

PUDEF

This will allow the user to redefine certain symbols in the PRINT USING statements.

```
10 REM ASSIGN PRINT USING
   FORMAT TO A$
20 A$ = "$###,###.##"
30 PRINT USING A$;10000.00
40 REM REDEFINE THE PRINT USING
   STATEMENT
50 PUDEF " .,":REM SWITCHES THE
   COMMA AND THE DECIMAL
60 PRINT USING A$;10000.00
```

DCLEAR

This command will simply initialize the drive specified.

```
10 DCLEAR      : REM INITIALIZE
   DRIVE 0 BY DEFAULT
20 DCLEAR D0 : REM INITIALIZE
   DRIVE 0
30 DCLEAR D1 : REM INITIALIZE
   DRIVE 1
```

TI$

Although this is not a command, the timecheck variable has changed in that it now displays the time up to tenths of a second. It may be set by using seven figures, or just six to make it compatible with an older program.

```
10 TI$="010000": REM NEW
   FORMAT
20 TI$="010000" : REM OLD
   FORMAT
```

This winds up the new and revamped commands in the Extended BASIC. Having the use of these new commands will definitely allow for easier and more structured programming.

MACHINE LANGUAGE MONITOR

The new monitor has all the old commands plus six new ones. The syntax of some of the old commands has changed to retrofit the new computer.

TIM is the Terminal Interface Monitor program for MOS Technology's 65XX microprocessors. It has been expanded and adapted to function on the B-Series computers. Execution is transferred from the CBM Basic interpreter to TIM by the SYS command. The monitor is incorporated as part of the Kernal.

Commands typed on the CBM keyboard can direct the TIM to start executing a program, display or modify registers and memory locations, load or save binary data, view other segments, send disk commands or read status, set default disk unit and load and execute programs by entering the program name (Segment 15 only). On modifying memory, TIM does not perform automatic read after write verification to insure that the addressed memory exists and is R/W type.

TIM COMMANDS

M Display memory
: Alter memory
R Display registers
; Alter registers
G Begin execution
L Load
S Save
V View Segment
U Set default disk unit

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@ Send disk command or get disk status
X Exit to basic
Z Transfer to second microprocessor
<file name> load and execute

SAMPLE USES OF MONITOR COMMANDS

M DISPLAY MEMORY

```
M 0000 0010
: 0000 0F 0F 4C D9 9A 00 00 00
00 00 00 00 22 22 9E 00
: 0010 00 00 00 00 00 00 00 D4
  FB 04 00 04 00 00 C4 FB
```

In a "display memory" command, the start and ending addresses must be completely specified as 4-digit hex numbers. To alter a memory location, move the cursor up in the display, type the correction and press RETURN to enter the change. When you move the cursor to a line and press RETURN, the colon tells the monitor that you are re-entering data.

R DISPLAY REGISTERS

```
R
   PC IRQ SR AC XR YR SP
; 0007 FBF8 B0 DD 71 04 71
```

The registers are saved and restored upon each entry or exit from the TIM. They may be modified or preloaded as in the display memory example above. The semicolon tells the monitor you are modifying the registers.

G BEGIN EXECUTION

```
G 0200
```

The Go command may have an optional address for the target. If none is specified, the PC from the R command is taken as the target.

L LORD

```
L "filename",08
```

No defaults are allowed on a load command. The device number and the file name must be completely specified. Operating system prompts for operator intervention are the same as for BASIC. Memory addresses are loaded as specified in the file header which is set up by the SAVE command. Machine language subroutines may be loaded from BASIC but care must be taken not to use BASIC variables as the variable pointer is set to the last byte loaded + 1. The machine language subroutine will be loaded into the segment that you are currently in as determined by the V command. After the load, the system will be initialized back to segment 15.

S SAVE

```
S "filename", 08,010200,010300
```

As in the load command, no defaults are allowed in the Save command. The device number, file name and a six byte start and end address must be given. The above example will save a program to device 8 from segment #1 starting at 0200 hex and ending at 0300 hex. The first two bytes are the segment number followed by the address. Valid segment bytes may be 00 to 0F depending on your memory. After a save, the system will be initialized back to segment 15.

V VIEW

```
V 01
```

This will change the segment to the one that you wish to view, save, load, or change memory from. The valid segments are 00 to 0F.

U UNIT ADDRESS

```
U 09
```

This command will allow you to set the disk unit default address while you are in the monitor. When leaving, the original address is reset. Valid unit addresses are 8 to 1F. These must be entered in HEX.

@ READ ERROR CHANNEL AND PROCESS DISK COMMANDS

@	:Display error message and clear channel
@ S1:filename	:Scratch specific file from drive 1
@ I0	:Initialize disk in drive 0
@ R0:newname = oldname	:Rename file on drive 0
@ *C1:filename* = oldname	:Copy file from drive 0 to drive 1
@ V0	:Validate or collect disk in drive 0
@ N1:file-name, id	:New or Header disk in drive 1

The above examples use the same syntax as the wedge program supplied with the disk drives.

file name LOAD AND EXECUTE FILE IN SEGMENT 15

This will load a machine language program from the disk and execute it. Its use is restricted to segment 15.

Z TRANSFER TO SECOND MICROPROCESSOR

This command will allow you to utilize the auxiliary processor when applicable.

X EXIT TO BASIC

```
X
```

This will cause a warm start to BASIC. In a warm start, memory is not altered in any way and BASIC resumes operation the way it was before the call to the monitor was made.

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News Releases

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TRAINS has eight challenging levels of gameplay. Movement from level to level only occurs when supply meets demand. Then, the track will extend to cover a larger territory as you forge your way across vast stretches of plains, mountains, deserts, and cities.

Both available from: Spinnaker Software, 215 First Street, Cambridge, MA 02142. Phone (617) 868-4700

SUNBURST EDUCATIONAL SOFTWARE FROM HES

Through the agreement with Sunburst Education, Human Engineered software has released under the HesWare™ brand name, Factory, M-ss-ng L-nks and Tri-Math for the Commodore 64.

FACTORY places users in the role of a creative design engineer with the job of creating geometric products on an assembly line. With FACTORY, users can employ several problem solving strategies, including analyzing a process, determining sequences and applying creativity.

For children 10 years and older, M-SS-NG L-NKS is a language puzzle that provides a painless way of improving writing, spelling, grammar and comprehensive skills. After using M-SS-NG L-NKS, individuals will develop an appreciation of syntax, vocabulary and the mechanics of writing.

To help children aged 6- to 12-years old improve their basic math skills, TRI-MATH uses an alien space intruder, a lovable dinosaur, and a mysterious mansion as a backdrop to practicing addition, subtraction, multiplication and division. TRI-MATH is recommended by the Curriculum Product Review of the National Educational Computer Review.

Available from: Human Engineered Software, Brisbane, CA. (415) 468-4111.

SCARBOROUGH INTRODUCES THREE NEW SOFTWARE PROGRAMS

Three new fun-while-you-learn products from Scarborough Systems, Inc. carry suggested retail prices of $39.95 to $49.95 each and are intended for immediate, untutored use by people of all age levels.

PHI BETA FILER is a flexible, multi-purpose home management program with hundreds of household applications. It incorporates both color and sound as it sorts and prints list materials alphabetically and numerically. Also included is PHI BETA FILER's *"Quiz Master"* mode, which can be used for developing games or in preparing for examinations.

It comes with two disks and may be used with one or two disk drives. The first disk is primarily used to develop and maintain files; the second, a data disk, is preloaded with helpful forms for a variety of home-oriented activities or for the storage of information.

Among the prepared files on the data disk are forms for listing credit cards and home inventories for insurance purposes; cataloging various sports records and collections; tracking tax deductible expenses; scheduling and tracking birthdays, anniversaries and other family occasions.

PATTERNMAKER is a versatile art and mathematics program that provides fun for users in constructing, manipulating, and animating symmetrical color patterns. Since "PatternMaker's" forms can be saved, retrieved and printed, the patterns can be used in many ways by artists, architects, weavers and others.

RUN FOR THE MONEY is an educational business game which allows the user to have fun while learning how to operate a profitable business. This fast-paced arcade action game, that two can play simultaneously, challenges the players' business skills and strategy in an alien environment.

The plot begins on the planet Simian, where the user's spaceship has suffered a forced landing. The shield that facilitates re-entry into the earth's atmosphere requires new paint for repairs. Having very little money, the user has to develop a

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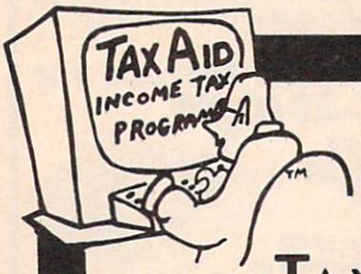

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MASTERTYPE typing tutorial is now available from Broderbund in cartridge format for the VIC-20. This program offers VIC-20 owners the opportunity to learn the skills of touch typing while engaging in the challenge and fun of a fast action arcade game.

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"Reviewed in *COMMANDER*"

A VERSATILE PRINTER

"Gemini 10X Printer"
STAR MICRONICS, INC.
P.O. BOX 612186
Dallas/Ft. Worth, TX 75261

Reviewed by Brian D. Hillis

With so many printers on the market today, it is a major job deciding which one will fit not only your requirements but also your pocketbook. Granted, it is very easy, and reasonalbe, to look only at the Commodore line of printers. However, most of these, within dollar-reach, are fairly restricted in their use. If you can live with normal, pica-sized print, with the occasional venture into "enlarged mode", then this is probably the route for you.

If, however, you would like a bit of variety in your printing, then have a look at the Gemini 10X printer from Star Micronics.

Now, before going any further, I should point out that I am a genuine "novice" when it comes to printers (heck . . . , I've only been playing with computers for less than a year). But that does not mean that I cannot figure out what works and what does not.

Connected to a Commodore 64 computer, through the serial port, via Cardco CARD/? interface (if you followed that, you shouldn't have any problems). the Gemini seems to be a dandy easy-to-use, little machine. That is, until you start to read the instructions for both the interface and the printer.

To start with, the Gemini printer has a tremendous number of features attached to it as a standard equipment. It even has optional extras, but more on that later. This is a conventional dot-matrix printer, with bi-directional, logic seeking printing (when using standard characters). If you are using its graphic mode, printing is unidirectional. Speed is at 120 characters per second. There are quite a number of character options, such as pica, elite, condensed, enlarged, condensed/enlarged, elite/enlarged, double-strike, emphasized, emphasized/double-strike/enlarged, and on, and on, and on. In addition, there are subscripts, superscripts, European characters, international characters, underlining, and all of these can be in normal or italic. To further confuse you, there are also programmable characters. Line feed can be set at 1/6, 1/8 or anything that you wish to progam into the machine, up to (or should that be down to) 1/44 of an inch.

As far as operating features are concerned, the Gemini really shows its versatility. Not only can you use the removable tractor-feed, but it also comes equipped with a removable bracket for telex roll paper (very economical), and best of all, you can use single sheets (yes, it is also friction feed).

Most of the printing modes and features are enabled/disabled via escape codes and/or character strings (CHR$). (No one said that learning to use the Gemini was going to be easy. However, several evenings with lots of scrap paper and the instruction manual in hand should bring you at least to the point where you will appreciate that this machine really can do a lot of fancy things.) There are two sets of switches on the Gemini that allow you to set things like line feed, italic characters, print pitch, paper-out signal, etc. Suffice to say, it is best to leave all of these switches (12 in total) in the off position and program the modes that you wish to use.

Two of the nicer features are the ease with which the user can replace both the ribbon and the printing head. After all, parts do wear out eventually. As a matter of fact, the pring head only strikes the top half of the ribbon, so after a few hundred thousand characters you can simply turn the two ribbon spools over and you have brand new ribbon. Optionally, yo can fit a 4K buffer (standard is 2K) and RS 232C serial interface.

In general, I enjoy the GEMINI 10X printer very much, although every time I use it, it is an adventure. It is not to be treated lightly, and once the user's manual is committed to memory, it can be a tremendously powerful piece of equipment. Although there are things that Star Micronics could have done to improve and make it easier to use, there are many things that put it head and shoulders above the competition.

CARDCO HAS YOUR NUMBER

Reviewed by Dennis Kelley

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Circle No. 25

keyboard approach used on typewriters.

Fret no more–help has arrived at your neighborhood computer store in the form of an inexpensive accessory keypad from Cardco.

The CARDKEY/1 is a 16-key unit which plugs into the joystick port of the VIC-20 or Control Port 2 of the C-64. The keys are arranged in standard calculator fashion with four rows–789 on top, then 456, 123 and Period, Zero, Enter keys on the bottom row. The math operators run down the right side: Multiply, Divide, Subtract, Add.

Cardco has included a cassette with the keypad which contains two programs. One program sets up the keypad as a printing calculator. The other program must be run when the computer is first turned on since the VIC and 64 don't look at the joystick port for input unless they are told to expect something there.

Each time you load the program at the start of a session, you are shown the standard value of the keys and offered the choice of Enabling the current values, Creating new values or Loading previously created values. Any key can be redefined to input any number or combination of symbols, numbers and letters up to eight characters long.

Commodore BASIC abbreviations are supported, so you can pack a lot of information into each keystroke. When I'm entering a program with a lot of DATA statements, I usually set up the keypad by changing the Multiply key to input "DATA;" the Period is changed to a Comma and the three other math symbols are used to print a listing:"/"=Ø(shift)P4,4,6:"–"=CMD4:L(shift)I(left arrow)"+"=?#4:CL(shift)Ø4. If you are writing a program which has little numeric input, you can redefine all 16 keys on the CARD KEY/1 since the regular keyboard characters are not affected by the changes you've made to characters on the keypad.

You can use the keypad to input printer control codes (you could turn Doublestrike on or off with a keystroke, change to Italics, etc.).

Cardco allows you to save your redefined key values to either tape or disk, so you don't have to look up those hard-to-remember printer codes every time you want to write a letter to Grandma. The manual also includes several dummy keypad layouts with space under each key name to write what the key is for after you changed it.

One caution, if you use a cartridge program, the keypad probably won't work with it. Cardco offers an adapter to wire your keypad into the keyboard lines directly. This involves opening the case, which voids the warranty on your computer. It should also be noted that the keypad cannot be redefined if it is directly connected to the computer's keyboard wiring. The adapter is priced at about ten dollars.

Documentation is written in an easy-to-follow format, with step by step directions for using both the KBASIC program which sets up the keypad and the CARD/CALC program which turns it into a printing calculator.

In my version of the instruction manual, one error which should be mentioned is that Commodore 64 users are instructed to plug the keypad into Control Port 1–where it is ignored.

The manual does provide helpful examples of how to use the keypad while programming. Virtually any character on the keyboard can be generated from the keypad (including graphic characters). The only exception I've found occurred when I tried to define a key to the Quote mark, but you can use Quotes as part of a statement, i.e., PRINT ".

Both C-64 and VIC-20 versions of the set-up program and the calculator program are included with the keypad, retailing for $39.95. An unexpanded VIC has about 3200 bytes free when using the keypad.

If you're looking for a low-cost add-on to make your computer easier to live with, Cardco has all the right numbers.

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LEONARDO DA COMPUTER

Reviewed by Robert T. Parr

"'64 Panorama"
Midwest Micro, Inc.
311 W. 72nd St.
Kansas City, MO 64114

We've all seen Commodore's advertisements demonstrating the C-64's terrific high-resolution graphics, and then wondered, "How do they do that?" Well, now there is '64 PANORAMA–a hi-res graphics utility program. It is available from Midwest Micro on cassette, for $29.95.

PANORAMA allows you to create complex drawings on your color or black & white screen. You needn't have any programming knowledge or even artistic skill to become a computer da Vinci. Instead, you simply use a joystick to control a cursor on the screen. Drawing is done by pressing the joystick button. This will either plot a point or draw a line from the existing cursor location to the last point that was drawn. There are nine different speeds of cursor movement, so you are able to set points with great precision.

It is a simple matter to define a background pattern for your picture. Just press the [f6] key, and the program will ask you either to enter a keyboard character or to define a character of your own. After you do this, the entire screen will be filled with this "design."

Midwest Micro has also included several other nice features in PANORAMA. For example, you are able to type captions and titles anywhere on your drawing. The program includes a screen dump utility for VIC printers. You are also given control of the border, background, and line colors.

However, '64 PANORAMA has its limitations, as most programs do. The lettering utility is somewhat awkward, and there is no convenient way to correct typing errors. To prevent ruining an entire drawing, I recommend saving the completed picture, and *then* adding the titles. This will allow you to reload the picture if you make a mistake. Also, I feel that the program could have allowed for greater control of color within the picture. Furthermore, I would like to see the print option available for non-Commodore dot matrix printers.

In conclusion, I find '64 PANORAMA to be a worthwhile program for any novice programmer or aspiring artist to have in his or her library.

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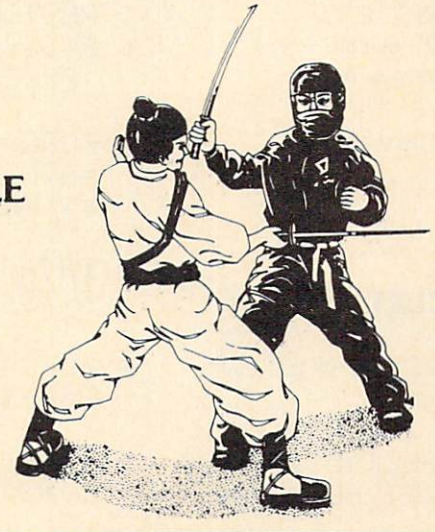

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RESCUE!

FOR THE 5K VIC-20
(JOYSTICK REQUIRED)

By Mike Scharland, age 16

In this game, you are an angel of mercy who must save several trapped people on ledges above a sea of sulfuric acid. Use the joystick to move left or right, and press the red fire button to go up. Otherwise gravity will pull you down when you are not sitting on a ledge. Don't touch the skull creature or hit your head on the underside of a ledge.

Your angel has 3 "lives", and a warning tone sounds when time is running out. If you choose a higher difficulty level, your angel will have less time to work.

Because of the VIC's limited meaning, the program must be loaded in two parts. First type in Listing 1, and SAVE it as "RESCUE1". Then type in Listing 2 and SAVE it as "RESCUE2". When you are ready to play, LOAD and RUN "RESCUE1", then LOAD and RUN "RESCUE2". Be sure your memory expansion cartridges are removed.

Hope you enjoy the challenge, as well as the graphics and sound.

Listing 1-"RESCUE1"

```
 5 POKE52,28:POKE56,28:POKE51,P
   EEK(55):CLR

10 CS=256*PEEK(52)+PEEK(51):FO
   RI=CSTOCS+511:POKEI,PEEK(I+
   32768-CS):NEXT

20 FORI=7168TO7215:READJ:POKEI
   ,J:NEXT

21 DATA0,0,0,0,0,108,255,255,8
   0,255,255,4,0,0,0,0

26 DATA36,60,126,255,255,126,6
   0,0,60,60,24,255,24,24,36,1
   02

28 DATA129,219,219,255,60,24,3
   6,102,56,46,127,255,248,255
   ,127,0

100 CLR
```

Listing 2-"RESCUE2"

```
 0 POKE36869,255:SC=0:LIVES=3:G
   OTO10000

 1 RESTORE:PRINT"[clr]":FORE
   E=8164TO8185:POKEEE+30720,5
   :POKEEE,0:NEXT

 2 FORQ=1TO5:READA:READB:FOREE
   =ATOB:POKEEE+30720,2:POKEEE
   ,1:NEXT:NEXT

 3 DATA7806,7811,7883,7887,796
   6,7970,7960,7964,8042,8047

 4 FORQ=1TO5:READA:FOREE=1TO2:
   B=A+INT(RND(1)*4)

 5 IFPEEK(B)=3THENB=B+INT(RND(
   1)*3)-1:GOTO5

 6 POKEB+30720,7:POKEB,3:NEXTE
   E:NEXTQ:POKE36875,0:POKE368
   74,0

 7 DATA7785,7861,7945,7938,802
   0
```

```
 8 X=7725:FORU7=7680TO7701:POK
   EU7+30720,2:POKEU7,1:NEXT

 9 PRINT''[home][blu][down, 7
   times]BBE'':PRINT''[home][d
   own, 10 times]BBE'':PRINT''
   [home][down, 14 times]BBE''

10 E(1)=7837:E(2)=7903:E(3)=79
   91

18 TI$=''000000''

19 IFTI>1300THENPOKE36878,3:PO
   KE36874,200:POKE36875,200:I
   FTI>2000-175*LEVTHEN4999

20 POKE37154,127:P=PEEK(37152)
   AND128:J0=-(P=0):POKE37154,
   255:P=PEEK(37151)

21 J2=-((PAND16)=0):FB=-((PAND
   32)=0):IFFBTHEN300

22 IFPEEK(X+22)<>1THENX=X+22:P
   OKEX-22,32:IFPEEK(X)<>32THE
   N1000

23 IFPEEK(X+(J0-J2))=3THENJ0=0
   :J2=0

26 POKEX,32:X=X+(J0-J2):POKEX+
   30720,4:POKEX,4

40 FORD=1TO3:POKEE(D)-4,32:POK
   EE(D)+30719,6:POKEE(D)-1,2:
   E(D)=E(D)+1

41 POKEE(D)+30719,1:POKEE(D)-1
   ,5

42 IFE(3)>8009THEN50

43 NEXT:GOTO19

50 FORT=1TO3:FOREE=E(T)-4TOE(T
   ):POKEEE,32:NEXTEE:NEXTT

51 FORY=1TO3:E(Y)=E(Y)-21:NEXT
   Y

80 GOTO19

300 POKE36878,13:POKE36877,137:
   POKEX,32:X=X+(J0-J2)-22:POK
   E36877,0:IFPEEK(X)<>32THEN5
   000
```


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Circle No. 162

```
 301 POKEX+30720,4:POKEX,4:GOTO4
     0

1000 IFPEEK(X)=3THEN2000

1001 IFPEEK(X)=0THEN1100

1010 POKE36878,15:FORBN=150TO128
     STEP-1:POKEX+30720,INT(RND(
     1)*8)+1:POKE36874,BN:NEXT

1011 POKE36874,0:POKE36879,6+2*L
     IVES:LIVES=LIVES-1:IFLIVES=
     0THEN4000

1012 X=7725:FORL1=1TO400:NEXT:GO
     TO18

1100 POKE36878,0:POKE36877,222:F
     ORP2=4TO0STEP-.05:POKE36878
     ,P2:NEXT:POKE36877,0:GOTO10
     11

2000 SC=SC+20:PRINT""[home][down
     ][cyn]POINTS:[yel]"";SC

2001 POKE36877,0:POKE36878,13:FO
     RL2=1TO10:POKE36876,INT(RND
     (1)*128)+128

2002 FORK=0TO10:NEXTK:NEXTL2:POK
     E36876,0:POKE36878,0

2003 IFSC=TS+200THENTS=SC:GOTO1

2004 GOTO19

4000 POKE36869,240:PRINT""[down,
      2 times][clr][grn]FINAL[sP
     ]SCORE:[yel]"";SC

4001 CLR:INPUT""[down][pur]ANOTH
     ER[sP]GAME(Y/N)"";A$

4002 IFA$=""Y""THENRUN

4003 END

4999 POKEX,32

5000 R6=0:FORE=X+44TO8185STEP22:
     R6=R6+1:POKEE-22,32:IFPEEK(
     E)=3THENTS=TS-20

5001 POKEE+30720,4:POKEE,4:POKE3
     6878,15:POKE36875,260-R6*8

5002 NEXT:POKEE+30698,5:POKEE-22
     ,0:POKE36875,0:POKE36874,0:
     GOTO1100

10000 POKE36879,8:POKE36869,240:P
     RINT""[clr][blu][down, 2 ti
     mes][sP, 3 times]INPUT[sP]S
     KILL[sP]LEVEL""

10001 PRINT""[down, 2 times][yel]
     [rvs-on]1[rvs-off][sP][grn
     ]SIMPLE""

10002 PRINT""[down, 2 times][yel]
     [rvs-on]2[rvs-off][sP][grn
     ]HARDER""

10003 PRINT""[down, 2 times][yel]
     [rvs-on]3[rvs-off][sP][grn
     ]YOU[sP]GOTTA[sP]BE[sP]FAST
     "":PRINT""[right, 2 times]F
     OR[sP]THIS[sP]ONE!""

10004 PRINT""[down, 2 times][rvs-
     on][yel]4[rvs-off][sP][red]
     INSTRUCTIONS""

10005 PRINT""[down, 2 times][cyn]
     "":INPUTLEV:IFLEV>4ORLEV<1
     THEN10000
```


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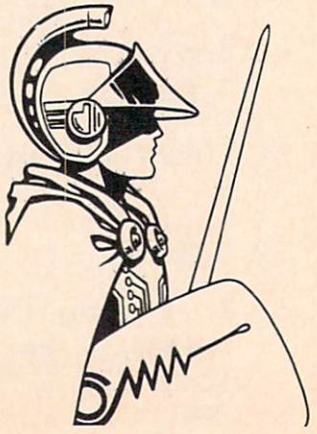

```
10006 IFLEV<>4THENPOKE36869,255:P
      OKE36879,14:GOTO1

10050 PRINT''[clr]YOU[sp]ARE[sp]A
      N[sp]ANGEL[sp]WITH[sp]THE[s
      p]MISSION[sp]OF[sp]SAVING[s
      p]SEVERAL[sp]TRAPPED[sp]PEO
      PLE'';

10051 PRINT''THAT[sp]ARE[sp]STUCK
      [sp]ON[sp, 5 times]LEDGES[s
      p]ABOVE[sp]A[sp]SEA[sp]OF[s
      p]SULFURIC[sp]ACID.''

10052 PRINT''YOU[sp]MUST[sp]FLY[s
      p]ON[sp]TOP[sp, 3 times]OF[
      sp]THEM[sp]TO[sp]SET[sp]THE
      M[sp, 3 times]FREE[sp]USING
      [sp]THE[sp]RED''

10053 PRINT''BUTTON[sp]ON[sp]THE[
      sp]JOYSTICKTO[sp]FLY[sp]AND
      [sp]THE[sp]LEFT[sp]&[sp]RIG
      HT[sp]CONTROLS[sp]TO''

10060 PRINT''MANUEVER[sp]THE[sp]A
      NGEL.[sp, 3 times]YOU[sp]MU
      ST[sp]BEWARE[sp]OF[sp]THESK
      ULL[sp]CREATURES[sp]WHOSE''

10061 PRINT''TOUCH[sp]IS[sp]FATAL
      [sp]TO[sp]YOU.YOU[sp]ALSO[s
      p]CANNOT[sp]LAND[sp, 2 time
      s]IN[sp]THE[sp]SULFURIC[sp]
      ACID''

10063 PRINT''OR[sp]HIT[sp]YOUR[sp
      ]HEAD[sp]ON[sp]1[sp]OF[sp]T
      HE[sp]LEDGES.''

10065 PRINT''[down][sp, 4 times]<
      HIT[sp]ANY[sp]KEY>''
```


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LETTERS

To the Editor:

I am having trouble locating geneology (pedigree) software for my C-64. Any help would be greatly appreciated.

R.E. Thomas
Jackson Hts., N.Y.

Dear George:

I am having a problem on your program "A Slot Machine for the C-64." Being 64, I thought it might be me. I have had different programmers look at the listing and they didn't see any mistakes. I really thought this would be fun for me, but I have scanned the program at least 20 times during October to January, and I still can't run it. Please let me know if the article is correct.

Mary
Ventura, CA

Note: There are step by step instructions on how to run the slot machine in the February 1984 issue of *COMMANDER*. See ReCOMMAND, page 111.

Dear Mr. Thompson:

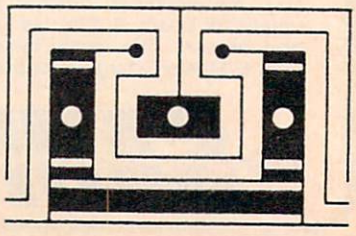
I have an expanded VIC and I hope you would soon put another D & D program in your *COMMANDER* Magazine. Knight Roller has helped me so far and I really need more programs!

Jeffrey McDonald, age 11
Flint, MI

To the Editor:

Regarding the Quick copy of the C-64 Disks (Dec.83/Jan.84, page 54). Excellent program! However, I found (2) errors which prevented proper operation. Delete = from lines 510 & 540 (page 60). You may want to pass this along to your other readers.

Gene Denick
Fairbury, IL



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DATA 20
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General Ledger(C) 21
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Elec. Spreedsheet(C) .. 21

EN—TECH
Studio 64(D) 28
Sprite Fun(C) 18

EPYX
sword Fargoal(C/D) 20
Crush Crumble(D) 20
Upper Reaches APS(D) 14

HES
Synthe Sound 64(R) ... 34
64 Forth(R) 40
Time/Money Mgr.(D) .. 48

INFO—DESIGNS
G/L (D) 61
A/P (D) 61
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3-D Man(C) 16

RAINBOW
Pers. Finance Assist.(D) 41

PSYCOM SOFTWARE
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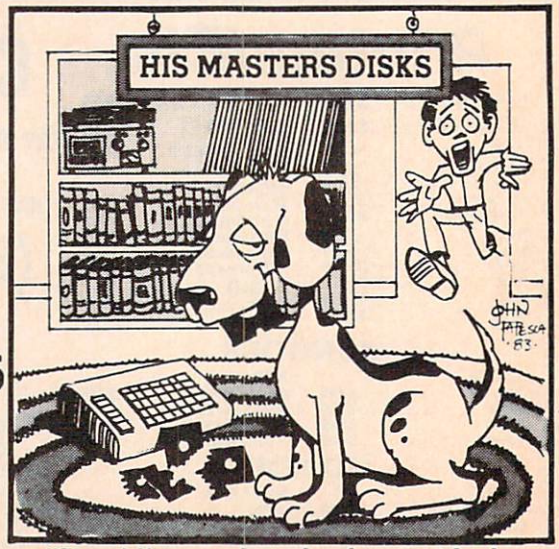

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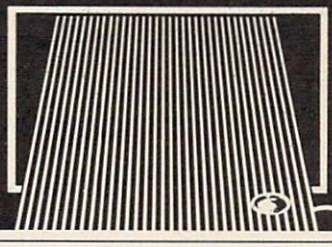

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Circle No.		Page No.
69	Abacus Software	45
2	Academy Software	7
89	Advanced Processor Systems	69
	Alien Group	81
	Apropos Technology	13, 73
102	Arfon Microelectronics	39, 57, 89
	Arkay Magnacomp	81
208	Automated Training Systems	22
246	Avalon Hill	15
162	Basic Byte, Inc.	89
	Boston Educational Computing, Inc.	27
	Cardinal Software	8
164	Cheat Sheet	63
213	Commodore Business Machines	Cover 3
10	Computer Alliance	68, 76
12	Computer Mat	49
185	Computer Mat	87
9	Computer Software Associates	47
44	Creative Software	17
	Databar	18
205	Datasoft	24
67	Double E Electronics	61
159	Dynatech Microsoftware Inc.	35
	Fabtronics	91
17	French Silk	85
204	Geneva Technologies Corp	16
19	Gloucester Computer	36
	GOSUB of Slidell, Inc.	52
16	GOSUB of Slidell, Inc.	20, 95
108	H & E Computronics	Cover 2
245	H & H Enterprises #2	39
220	Handic Software Inc.	1
95	ICD Corporation	74
	Input Systems	72
	Intervinyls	95
97	JMD	92
22	Leading Edge Products, Inc.	Cover 4
209	Loop Software	50, 86
70	Lynn Computer Service	67
99	(M)agreeable	43
	Memotron	76
235	MFJ	81
	Microclear	82
224	Micro 80	91
113	Microperipherals	43
	Micro Signal	62
28	Micro Spec	4
94	Micro-Sys	79
173	Micro Technic Solutions	20
55	Micro-Ware Dist. Inc.	8, 94
25	Midwest Micro, Inc.	85
234	Nibble Notch	76
218	Northland Accounting, Inc.	82
228	Omnitronix	44
	Optimized Data Systems	77
238	Orange Micro	9
71	Pace	60
	Performance Micro Products	53
76	Pro-Line Software	32
34	Protecto Enterprizes	41
	P-Technology	37
47	Public Domain, Inc.	83
140	Pyramid Computerware	53
142	Quick Brown Fox	23
77	Rees Software Laboratories	75
	Rocky Software	72
179	Saura	91
210	Skyles Electric Works	26
38	Skylight Software	66
	Southwestern Data	55
119	Strategic Simulations	25
242	Sundial	71
149	Susie Software	78
	TPUG	95
122	TSASA	78
123	Universal Software	14
	U.S. Commodore User's Group	90
183	Xetec	75
225	York 10	83

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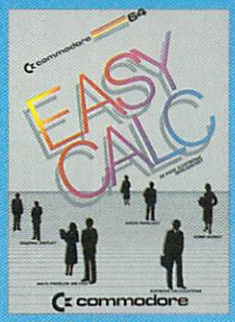

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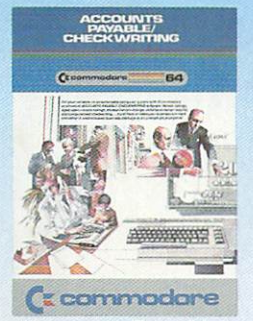

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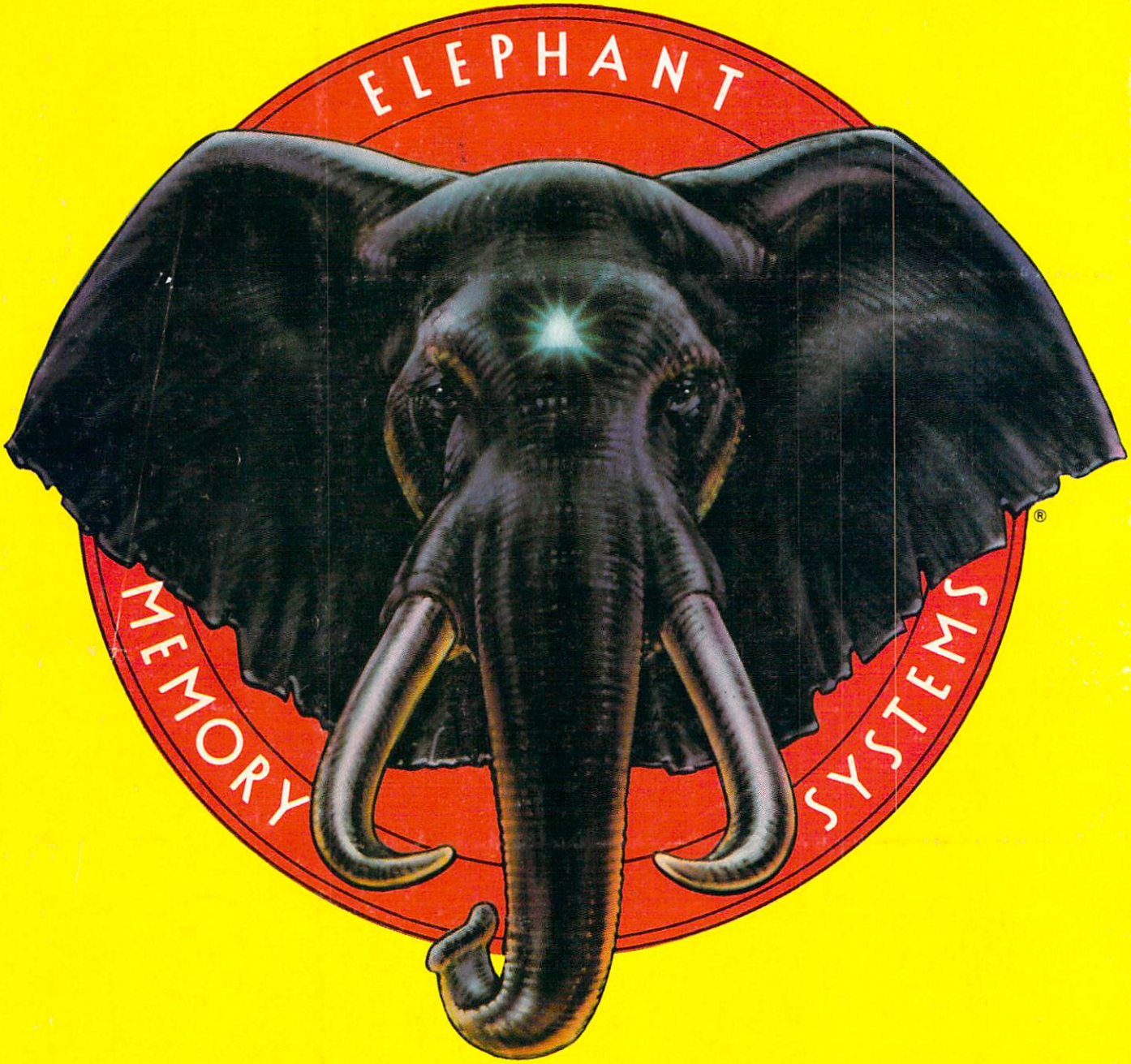

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